AD-A149 368 HEAVY-LIFT BREAKBULK SHIP PRETEST RESULTS OF THE JOINT LOGISTICS-OVER-THE..(U) ORI INC ROCKVILLE MD H CASEY ET AL. 25 JUL 77 ORI-TR-1168 MDA903-75-C-0016 1/2

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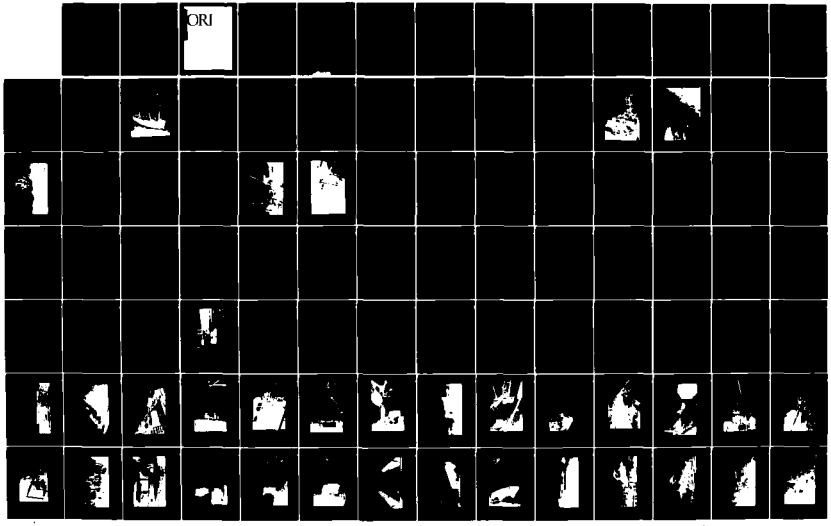

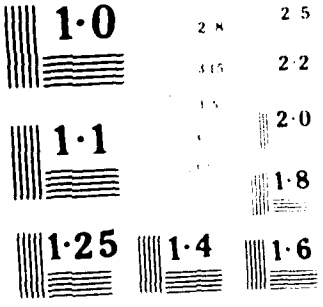
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HEAVY-LIFT BREAKBULK SHIP PRETEST RESULTS OF
THE JOINT LOGISTICS-OVER-THE-SHORE (LOTS)
TEST AND EVALUATION PROGRAM

25 JULY 1977

Prepared Under
Contract Number MDA-903-75-C-0016
For the Office of the Secretary of Defense
Deputy Director (Test and Evaluation)
Office of the Director, Defense Research and Engineering
Washington, D.C. 20310

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Test and

Final Report
Dec 76 - Jun 77

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25 July 1977

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Representative - Mr. Howard Kreiner

		Operating	LACV-30
		Embarkation	LARC-LX
		Flag vessels	LCU
		Heavy-lift	Loading
		Joint Test	Lighterage

The major objective of the Heavy-Lift Breakbulk Ship Pretest was to determine the capabilities of the Services to use such a ship for deploying selected Logistics-Over-The-Shore (LOTS) equipment to a site where fixed port facilities do not exist. This test was the third of five planned preliminary tests of the Joint LOTS Operational Test and Evaluation Program conducted under the sponsorship of the Deputy Director (Test and Evaluation), Office of the Director, Defense Research and Engineering. The pretest was conducted from anchorages off Sewells Point, Norfolk, Virginia, and Ft. Story, Virginia.

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The pretest, conducted 1-9 November, 1976, was part of an evaluation program leading to a major LOTS exercise in August, 1977. The heavy-lift ship was tested in order to verify the capabilities for deploying newly procured LOTS equipment assembled in a near ready-to-use configuration. It was anticipated that a LOTS beach and throughput system could be established more rapidly if equipment assembly requirements were minimized. Operational response time would be significantly improved because the detailed disassembly—required for embarkation aboard conventional breakbulk ships, containerships, and most bargeships—would not be required for the heavy-lift breakbulk ship.

A secondary objective, conducting a container-oriented throughput operation, was added to the pretest by the Services. This objective was included for training purposes and for eliminating potential technical problems during the LOTS main test.

The results of the pretest indicated that equipment could be deployed with minimal disassembly and emphasized the continuing need for the heavy-lift breakbulk ship. Anticipated time savings are on the order of 53 hr in deployment of the 300-ton capacity crane with minimum disassembly. This is compared to the time needed for the more detailed disassembly required when only conventional breakbulk ships are available.

The heaviest item loaded was a 1466-class LCU that weighed 180 long tons. A 1466-class LCU was scheduled for loading but lacked an appropriate sling. A recommendation was made that such a sling be included as part of the ship's equipment. Except for the 300-ton crane, all equipment was loaded/unloaded without difficulty. Handling of the 300-ton crane was complicated by the fact that it was rigged incorrectly. Also it had to be placed in the LCU backwards so that the combined center of gravity of the LCU with the crane was far enough aft to be safe and seaworthy. Consequently, after it was backed out of the LCU, the crane had to be turned around on the beach, a move that delayed the crane's operational readiness for several hours.

During the container throughput phase a temporary containership discharge facility (TCDF), an Army 300-ton lifting capacity crane mounted on a DeLong barge, was used by military personnel to unload containers from a ship

[illegible] proved the concept feasible [illegible] pretest provided an oppor- [illegible] the amount of derating to [illegible] when it is operating on an unstable [illegible] are expected in a later report to be pub- [illegible] be utilized during the LOTS main test.

[illegible] form a pier at the beach. The DeLong, [illegible] was beached, pickhead, ramps lowered, [illegible] The pier with the 140-ton crane [illegible] for containers.

[illegible] was the Army's 300-ton capacity crane [illegible] and used as a crane-on-beach container [illegible] time-on-beach and the 140-ton crane in [illegible] inability to reach containers in lighters [illegible] were successfully and con- [illegible] newly term, was employed to load con- [illegible] using the TCCF, but wave motion and con- [illegible] the chassis made this operation too time- [illegible] successfully used to lighter containers at [illegible] where a frontloader rapidly off-loaded [illegible] chassis.

[illegible] the [illegible] the Services capabilities for using [illegible] heavy and outsized equipment. [illegible] because of its weight and size, is the [illegible] the first opportunity in over 4 years [illegible] This opportunity provided the ex- [illegible] which will be amplified during the main

ABSTRACT

[illegible] Heavy-Lift Breakbulk Ship Pretest was to [illegible] services to use such a ship for deploying [illegible] equipment to a site where fixed port [illegible] the third of five planned preliminary [illegible] Test and Evaluation Program conducted under [illegible] (Test and Evaluation), Office of the [illegible] Engineering. The pretest was conducted from [illegible], Virginia, and Ft. Story, Virginia.

[illegible] November, 1976, was part of an evaluation [illegible] exercise in August, 1977. The heavy-lift ship [illegible] capabilities for deploying newly procured [illegible] ready-to-use configuration. It was anti-[illegible] throughput system could be established more [illegible] requirements were minimized. Operational re-[illegible] improved because the detailed disassembly-[illegible] conventional breakbulk ships, containerships, [illegible] required for the heavy-lift breakbulk ship.

[illegible] establishing a container-oriented throughput [illegible] the Services. This objective was in-[illegible] eliminating potential technical problems [illegible]

[illegible] pretest indicated that equipment could be deployed [illegible] disassembly, and emphasized the continuing need for the heavy-lift breakbulk ship. It indicated time savings are on the order of 53 hr in deploy-[illegible] capacity cargo with minimum disassembly. This is compared [illegible] the time needed for the more detailed disassembly required when only con-[illegible] breakbulk ships are available.

The heaviest item loaded was a 140[illegible]-class LCU that weighed 190 long tons. A 1030-class LCU was scheduled for loading but lacked an appropriate sling. A recommendation was made that such a sling be included as part of the ship's equipment. Except for the 300-ton crane, all equipment was loaded/unloaded without difficulty. Handling of the 300-ton crane was complicated by the fact that it was rigged incorrectly. Also it had to be placed in the LCU backwards so that the combined center of gravity of the LCU with the crane was far enough aft to be safe and seaworthy. Consequently, after it was backed out of the LCU, the crane had to be turned around on the beach, a move that delayed the crane's operational readiness for several hours.

During the container throughput phase a temporary containership discharge facility (TCDF), an Army 300-ton lifting capacity crane mounted on a DeLong barge, was used by military personnel to unload containers from a ship for the first time. A previous exercise, [illegible] II, proved the concept feasible on a larger barge using civilian operators. This pretest provided an opportunity to instrument the crane for an evaluation on the amount of derating to the crane's lifting capacity is necessary when it is operating on an unstable "floating" platform. These findings are expected in a later report to be published by a Naval laboratory and will be utilized during the LOTS main test.

A DeLong barge was also used to form a pier at the beach. The DeLong, with ramps and a 140-ton crane aboard, was beached, jacked-up, ramps lowered, and became operational in approximately 18 hr. The pier with the 140-ton crane was then used as an unloading facility for containers.

Also tested for the first time was the Army's 300-ton capacity crane which was placed at the high water line and used as a crane-on-beach container unloading facility. Both the 300-ton crane-on-beach and the 140-ton crane on the DeLong pier were hampered by an inability to reach containers in lighters at low tide. Amphibians—LARC-LXs and LARC-XVs—were successfully and continuously used during calm seas. A causeway ferry was employed to load containers on milvan chassis at shipside using the TCDF, but wave motion and container alignment difficulties with the chassis made this operation too time-consuming. The causeway ferry was successfully used to lighter containers at low tide and over sandbars to the beach where a frontloader rapidly off-loaded the containers and placed them on milvan chassis.

In summary, the pretest verified the Services' capabilities for using a [illegible] breakbulk ship to deploy certain LOTS heavy and outsized equipment. Only one not considered feasible, because of its weight and size, is the DeLong barge. The pretest also provided the first opportunity in over 4 years to conduct a container throughput exercise. This opportunity provided the experience required by military personnel which will be amplified during the main test.

TABLE OF CONTENTS

[illegible]

I. INTRODUCTION

BACKGROUND

The principal objective of the heavy-lift breakbulk ship pretest was to determine the capabilities of the Services to use a vessel of this type to:

- Deploy heavy and outsized, mission-essential, Logistics-Over-The-Shore (LOTS) equipment to an off-shore site,
- Off-load and transport the equipment to shore in landing craft deployable aboard the ship, and
- Prepare the equipment on the beach for LOTS throughput operations.

A secondary objective, conducting a container-oriented throughput operation, was added to the pretest by the Services for training purposes and for identifying potential unforeseen technical problems during the LOTS main test. These objectives were accomplished in an exercise conducted November 1-9, 1976. The test began with the ship at anchorage in Hampton Roads, Virginia, where equipment was loaded and continued off Ft. Story, Virginia, where ship discharge and throughput operations took place.

The heavy-lift breakbulk ship pretest also offered a less obvious but important feature besides verifying the deployability of new equipment. There is rarely an opportunity for deployment of very large and heavy equipment, especially if handling by military personnel is required. The paucity of heavy-lift ships and the cost, difficulty, and infrequency of repositioning outsized, heavy equipment have diminished the familiarity and skill of military personnel in dealing with such equipment. Accordingly, it was found that some "rediscovery" of the special equipment and handling considerations was necessary for supporting this type of operation.

[illegible]

[illegible]

[illegible]

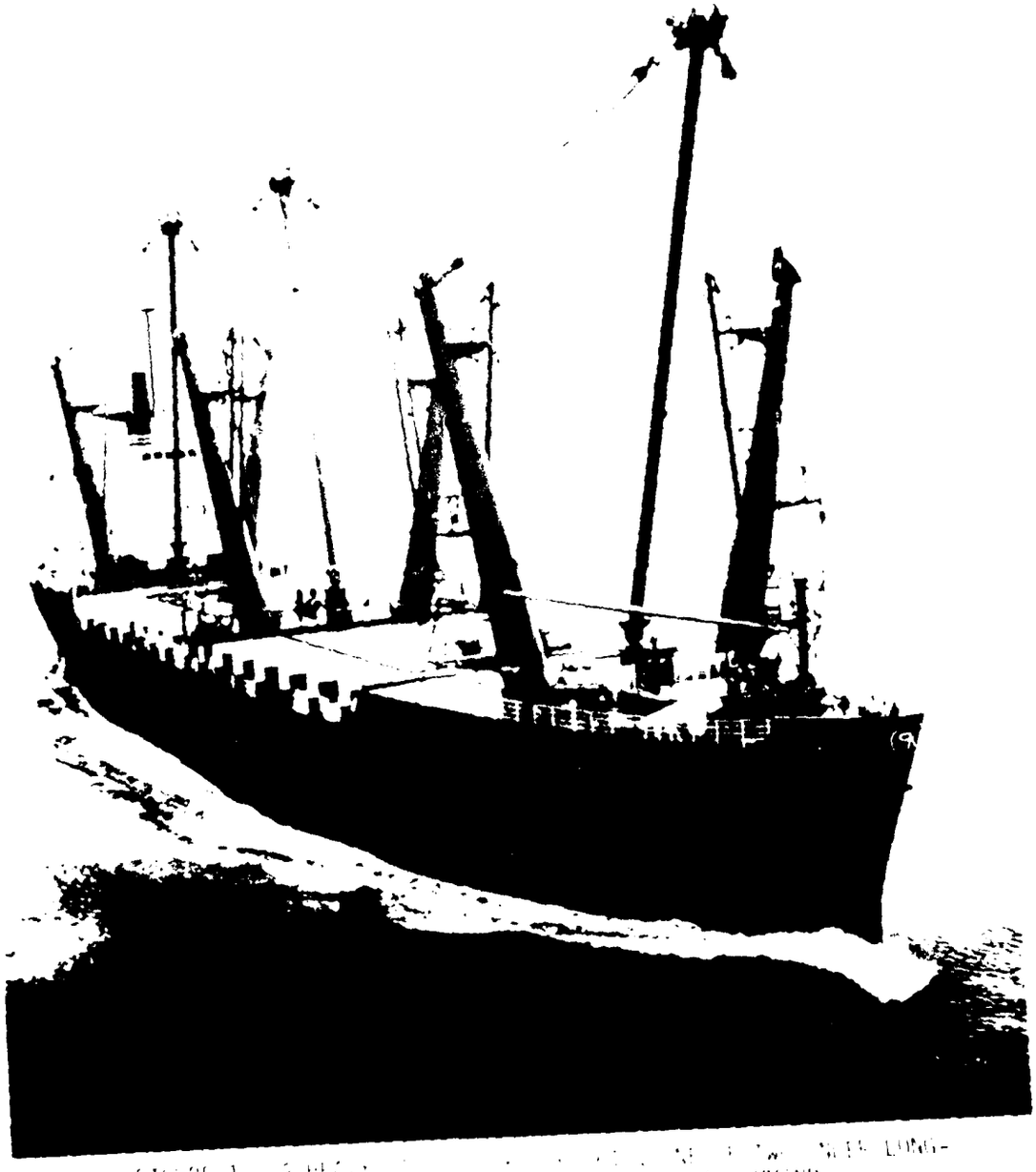


FIGURE 1. [illegible] LONG-
[illegible] MOUND

heavy items such as [illegible], [illegible]-lbs, and locomotives. Second, there are three 120-long ton [illegible] booms, 100 ft in length which permit loading large heavy items in holds 2, 3, and 4. The 120-ton booms can also be paired to work together giving the ship a nominal 240-ton lifting capacity,* permitting the hoisting of an [illegible]. A total of four LCMs can be stowed on the main deck. Figure [illegible] illustrates the capability for use singly or paired. The general characteristics of the two heavy-lift breakbulk ships are contained in Table 1. Appendix A contains more detailed information on ship characteristics.

TABLE 1

GENERAL CHARACTERISTICS
S.S. TRANSCOLORADO AND S.S. TRANSCOLUMBIA

Type of vessel: Single screw [illegible] transport converted to [illegible] ship having a heavy-lift capability of 240 tons. Vessel was originally built in 1945 and converted by Newport News Shipbuilding and Drydock Co., Newport News, Virginia in July 1944.	
Length overall	522 ft [illegible] in
Length between perpendiculars	494 ft [illegible] in
Breadth, molded	71 ft [illegible] in
Depth to main deck at side, molded	41 ft [illegible] in
Draft to assigned waterline, molded	32 ft [illegible] in
Displacement in salt water	21,770 tons
Deadweight	11,475 tons
Draft horsepower - normal	9,000
Continuous sea speed	16 knots
Light ship characteristics	
Displacement	10,295 tons
Vertical center of gravity, KG	27.83 ft above keel
Longitudinal center of gravity, LCG	236.34 ft fwd of A.P.
Officers and crew	38
Number of cargo holds	5

* The TRANSCOLUMBIA's master and chief mate reported that on one occasion the ship had loaded and discharged a 300-ton tugboat.

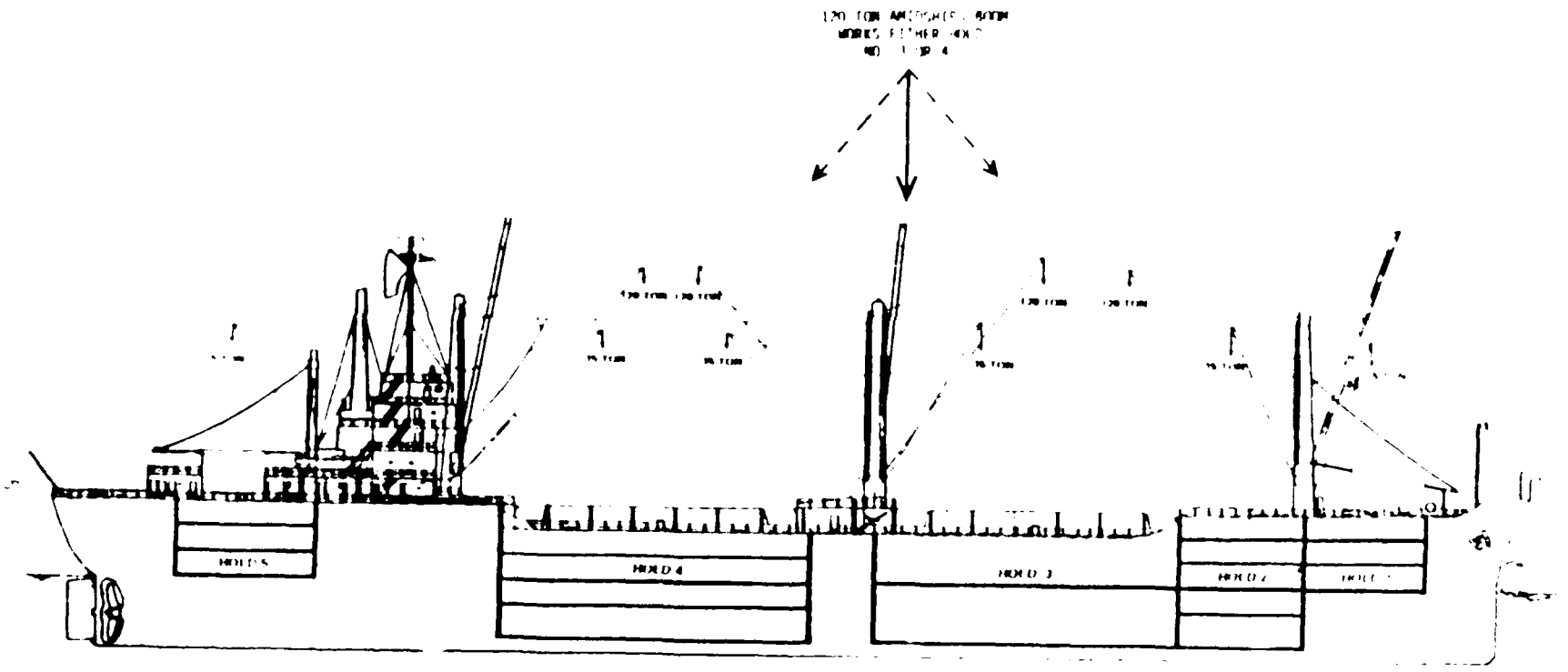


FIGURE 2. HEAVY-LIFT BREAKBULK SHIP PROFILE

[illegible]

The test [illegible] were the heaviest [illegible] containerized cargo at a [illegible] criteria eliminated, [illegible] the characteristics of the [illegible].

[illegible] were not tested [illegible]:

- [illegible] could not be [illegible] tests.
- [illegible] a reluctant [illegible] was be retested [illegible] capabilities.
- [illegible] test [illegible] for the [illegible].
- [illegible] a ship was not [illegible].

[illegible] is needed to transport [illegible] were embarked in a tactical, disassembled configuration. [illegible] the crane is defined as the minimum disassembly [illegible] overseas. In a tactical disassembly [illegible] all sections of the boom [illegible] the counterweights and out-rigger floats. [illegible] from approximately 150 long [illegible] time in the test. This is as opposed [illegible] extensive disassembly into components of less than [illegible] and requiring [illegible] days for reassembly.

The [illegible] crane [illegible]-ton lifting capacity is smaller and lighter [illegible] crane and is a suitable load for an LCM8, which has a capacity of approximately [illegible] short tons and can be deployed on most commercial ships. [illegible] the [illegible] crane was loaded into an LCM8 but loading from a [illegible] ship presented different problems discussed in detail [illegible].

[illegible], the [illegible], was embarked for the first time in the [illegible] series. The heavy-lift breakbulk ship was the only ship tested that [illegible] capacity (more than [illegible] long tons) and space available to [illegible] the [illegible].

[illegible] in this instance refers to the Army [illegible] pier and [illegible] discharge facility [illegible]. The latter is a [illegible] with a large crane mounted on it. The [illegible] is positioned alongside a [illegible] for unloading operations.

TABLE 2

HEAVY-LIFT SHIP PRETEST PLANNED LOADS

Lifts Planned	Characteristics					Remarks
	Lift Made	Length (Ft)	Width (Ft)	Height (Ft)	Weight (Tons)	
[illegible] Model [illegible] ton [illegible] capacity) crane, tactical disassembly	Yes	57.6	12	13.5	98	
[illegible] Model [illegible] ton [illegible] capacity) crane, tactical disassembly	Yes	48.5	11.3	9.4	42	
[illegible]	Yes	62.5	26.6	15.3	88	
[illegible]-Class LCU	Yes	119	34	17.8	180	
[illegible]-Class LCU	No	135.3	29	17	151.8	No sling available
[illegible] Model Sideloader	Yes	41	12.5	11.7	64	Top handler removed.
Clark Frontloader	No	30.5	13.2	16.5	69.3	Not received in the inventory. Top handler [illegible] removed.
[illegible]-30	No	76.3	33	21.5	27.7	Not available for loading
[illegible] x 15 Causeway Section	No	90	21.3	5.1	60.3	Lift was redundant*
[illegible]-ft Milvans	19	20	8	8	–	Weights varied by container
[illegible]-Ft Container	1	40	8	8	30	

* See [illegible] Technical Report No. 1037.

[illegible] equipment deployment aspects of the test the most important [illegible] were [illegible] the physical feasibility of moving the LOTS equipment with [illegible] equipment, once in the objective area, making the equipment [illegible] operations. Thus, observations were concerned with matters [illegible] centers of gravity (did the item hang in an appropriate [illegible] lift slings with lift points, any pendulation problems [illegible] and the like. Times required for deployment of [illegible] items were measured to support main test planning. Crane cycles [illegible] throughput data samples were also obtained. The throughput rates [illegible] and the factors that influence them were additional inputs to main test [illegible].

[illegible] the ship off-loading measurements were made of the sea state and [illegible] the TCF platform. An ancillary test to measure the stresses [illegible] of the TCF was also conducted. These measurements, made by [illegible] the Naval Civil Engineering Laboratory at Port Hueneme, California, will be the subject of a separate Navy report. The results may assist the Joint [illegible] Test and Evaluation Program by establishing better safe working limit criteria for the LOTS crane working in this environment.

Finally, observations were made of the way various equipment functioned in the environment and of cargo documentation and control procedures.

II. OPERATIONS

[illegible] SUMMARY

The operations began about 0700 hr November 2, 1976, with the [illegible] MSTS at anchor off Sewells Point in Hampton Roads. Weather conditions during the loading and discharge phases of the pretest were clear with a light-to-calm wind and calm seas at both the Sewells Point anchorage and off Blue Beach, Ft. Story.

Preparations for loading required approximately 3 hr and included the opening of hatches and the loading of dunnage, cargo rigging sets, and [illegible]. Loading of test cargo was accomplished using the ship's 120-ton booms which are designed to move very large objects and, hence, move rather slowly. [illegible], the first day, only containers and the LARC-LX were loaded before [illegible] operations. On most ships round-the-clock operations are [illegible] but with the heavy-lift ship this is not advisable because of the [illegible] long booms (100 ft) and the need for the boom operator to con[illegible], watch the line passing through the sheaves at the boom tip. This is [illegible] to observe at night since artificial light at the 100-ft distance [illegible] inadequate.

The first lift on the second day was the 1466-class [illegible], which was [illegible] on the starboard side of Hold No. 4 without difficulty. The 9125 crane subassembly was loaded and stowed in the well deck of the [illegible]. At hold No. 3 the 6250 crane was loaded on the port side and the sideloader on the starboard side. All lifts were made in a fairly routine fashion except for the 6250 crane which was lifted with a pronounced fore and aft tilt.

Off-loading began about 0730 on 4 November after the ship had moved to an anchorage off Blue beach, Ft. Story. The order for off-loading was the 6250 crane, sideloader, the 40-ft container, the 9125 crane, the 1466-class [illegible], and the LARC-LX. Only the 6250 crane posed any difficulties and this was

[illegible]

[illegible] was used to [illegible] initiate [illegible] exercise the [illegible] containers from the holds of [illegible] was completed. A [illegible] the exercise as a substitute for the ship [illegible] were experienced. November, [illegible] was possible the [illegible] was timed [illegible]

[illegible] were used to [illegible] containers were [illegible], the containers were [illegible] were [illegible] were [illegible] essing of standard [illegible] containers [illegible].

[illegible] with the [illegible] heavy-lift [illegible] were used [illegible] such as [illegible] operation of the heavy-lift booms is normally [illegible] to use the heavy-lift [illegible] special [illegible] the large hatch covers, [illegible] each weighing 10,560 lb [illegible] As much as an hour may be [illegible] weather deck cargoes, although matches [illegible] allowing for loading or off-loading [illegible] start-up time.

[illegible] containers were [illegible] to become the through- [illegible] the [illegible] booms, which have [illegible] were [illegible] rent for these [illegible] required an average of [illegible] minutes each. [illegible] (see Figure [illegible], page [illegible]), to use some [illegible] weight and a lengthy change of booms and rigging would have been necessary, if the 140-ton booms were used.

[illegible] into hold No. [illegible], the 140-ton boom between [illegible] had the most capability to maneuver the load. [illegible] hold No. 4, it was necessary to swing it over. [illegible] over No. 4 hold and passed through a [illegible] were over the other side to No. 4 hold. This

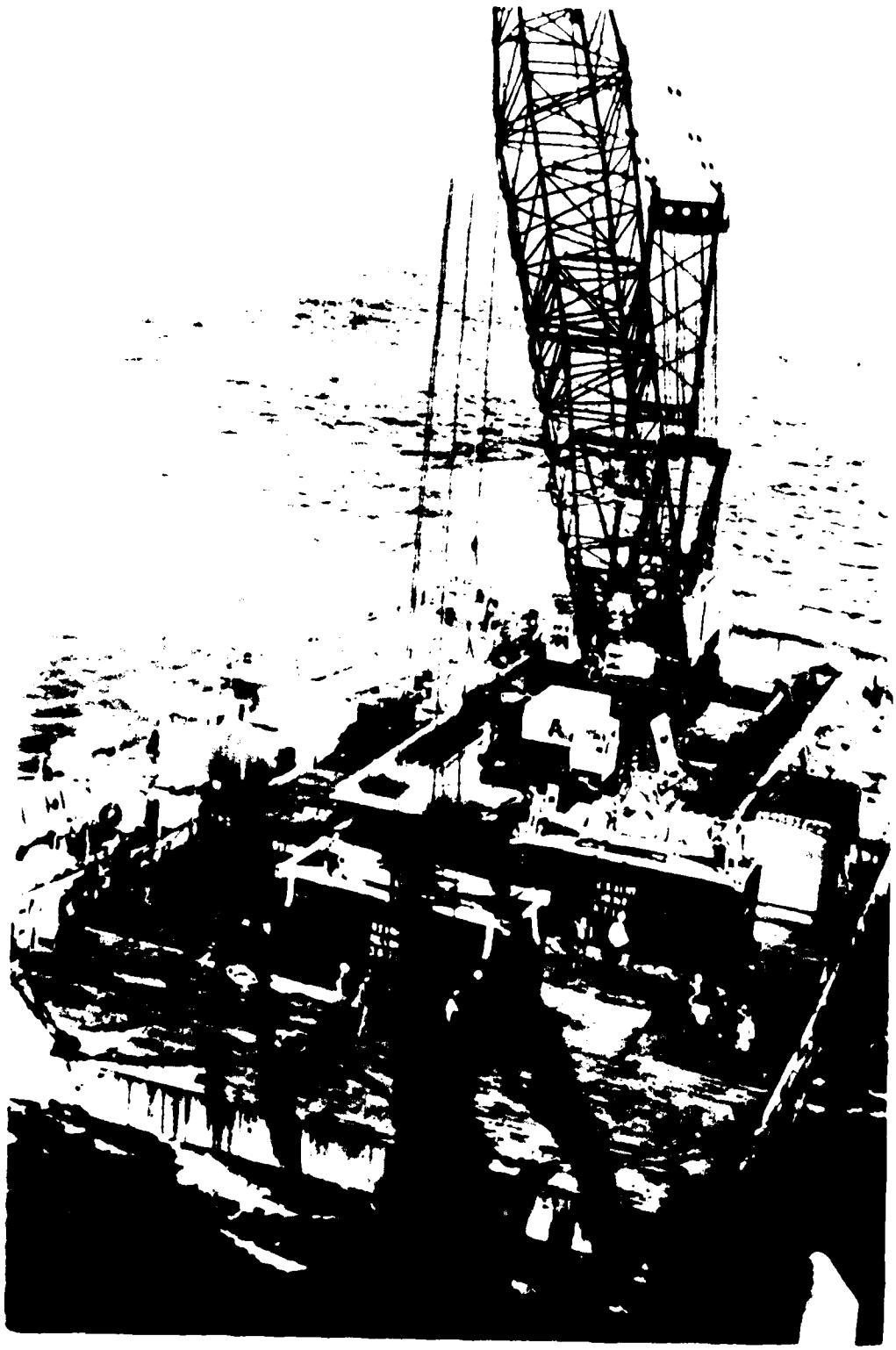


FIGURE 3. TEMPORARY CONTAINERSHIP DISCHARGE FACILITY

[illegible]

[illegible]

[illegible]

TABLE [illegible]

HEAVYLIFT BREAKBULK [illegible] SUMMARY

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Main Deck [illegible]	[illegible]	[illegible]	
[illegible] and [illegible]	Between Hatchways #4 [illegible]	[illegible]		
	Main Deck # 5			
[illegible]	Between Hatchways # [illegible]	[illegible]	[illegible]	[illegible]
	Main deck [illegible] #5	[illegible]	[illegible]	[illegible]
[illegible]	Main deck [illegible] #	[illegible]	[illegible]	[illegible]
[illegible]	Main deck [illegible] (concrete [illegible]	[illegible]	[illegible]	Lift [illegible] rigging [illegible]
[illegible]	Main deck [illegible]	[illegible]	[illegible]	Lift [illegible]

FIGURE 5. ATTACHMENT POINTS TO ADJUST SPREADER BAR FOR CENTERS-OF-GRAVITY ON 6250 AND 9125 TANKS

was successful, although there were minor delays in inserting the strap under the [illegible] of the lifting frame and also in manhandling the loops of the strap over the [illegible] of the ship's heavy-lift boom.

The smaller crane, the 9125, was lifted first. There was a delay while the crane upper was rotated 180 degrees. The boom base was over the crane truck cab in the final configuration. After a test lift the crane was set down again in the [illegible] and the nylon loop inspected. The lift was then made without any further delays.

The lift of the 6250 crane was the final heavy lift and was the only one that required an on-the-spot decision. The same lifting frame that was used for the smaller crane was used for the 110-ton 6250 crane lift. As the lifted started, the load nosed up. The front wheels were about 3 ft off the deck before the rear wheels began to lift clear. The crane boom, facing the rear, slanted downward toward the ramp of the LCU it was being lifted from. If the lift had continued, the boom presumably would have come in contact with the top edge of the ramp. Experience in the breakbulk ship pretest[1] had shown that even seemingly minor bumps impacting on the tubular frame of the crane boom can cause dents that seriously affect the maximum lift capability of the crane. Thus the possibility of contact had to be minimized.

The way to avoid the problem would have been to re-rig the lift so that it remained level. This would have involved shifting the lift point at the apex of the lift frame from one point to another in the series of holes available. However, such re-rigging would have been time-consuming. A decision was made to continue the lift, but to first lower the LCU ramp so as to provide increased clearance. This was done and the lift proceeded with the crane at a pronounced slant. As the crane started downward toward the deck of the ship the tilt would have caused the boom base to make contact with timbers on the hatch top before the crane wheels made contact. To avoid this possibility caused a delay of about 15 minutes. The crane was repositioned in such a way that the boom base was located over a gap between the timbers of hatch number 3 and the deck house. This allowed the crane wheels to touch before the tip of the boom base. With that problem solved, the lift was completed.

The total time required for lift, including delays, was 2 hr and 12 minutes. There were three delays [illegible] waiting for the LCU to tie-up in the proper [illegible], [illegible] malfunction, and 15 minutes for the crane [illegible]. [illegible] lashing of this lift the ship weighed [illegible].

[illegible]

General

[illegible] lift began at [illegible], November 4. The weather was [illegible] were [illegible] the most part the order

[1] Operational [illegible] of the Conventional Breakbulk Ship Pretest of the [illegible] Over-the-Shore (OTS) Test and Evaluation Program, [illegible] October 1976.

the equipment off-loading was the reverse of that for loading. In general, off-loading proceeded at a good rate and, with the exception of the [illegible] crane, equipment preparation ashore was completed in a timely fashion so that throughput activity could begin. Table 4 provides a summary of equipment off-loading times and time required to make the equipment ready for operations.

[illegible] Crane

The first lift to be unloaded was the [illegible] crane. The rigging used for loading was again used. However, a modification was made to the [illegible] the lift complex. This meant that the crane was off-loaded [illegible] so that the lowest point on the crane when being lifted was not the wheels but the boom tip, a damage-sensitive component. [illegible] lowest point [illegible] the [illegible] well [illegible] where the ramp hinges, the [illegible] boom tip. Once the crane wheels [illegible] the deck, the boom [illegible] clearance [illegible] was landed on the [illegible]. Figure 6 shows the [illegible] at which the crane was lowered with [illegible] indicating the bar for [illegible] to compensate for [illegible] center of gravity. Figure 7 shows [illegible] had been landed on the [illegible].

[illegible] had been adjusted [illegible], the crane could have been [illegible], but it still would have been necessary to load the [illegible], the [illegible] with the [illegible]. The lifting frame interferes with the [illegible] with the crane [illegible] forward, the center of gravity [illegible] operation of the [illegible]. Therefore, if the beach the [illegible] off the landing craft [illegible]. Before it would be [illegible] the floats, [illegible] and [illegible] after- [illegible] assembled. The process of [illegible] the crane, [illegible].

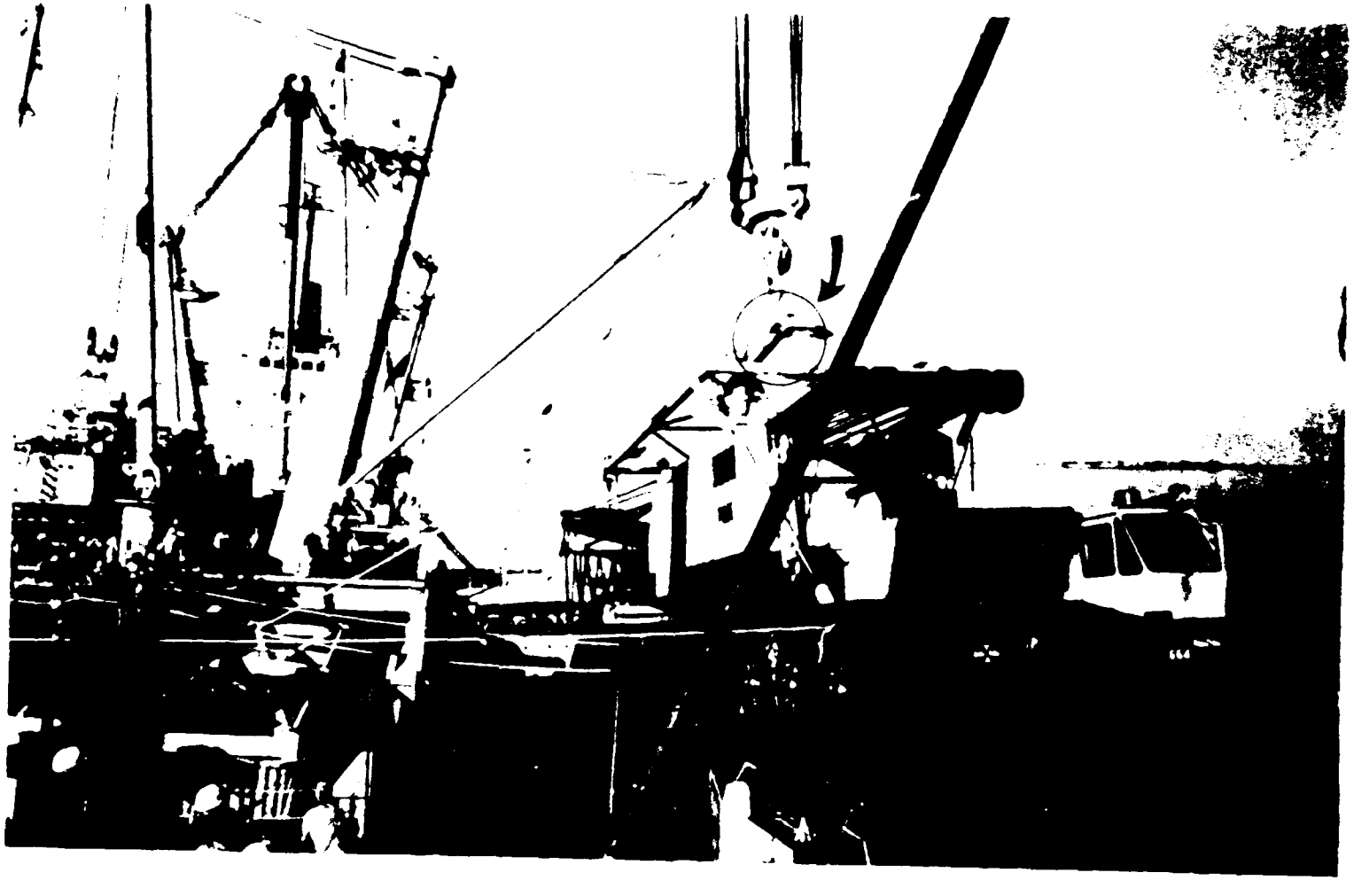
[illegible] with the crane [illegible] water [illegible] after [illegible]. It was [illegible] two bulldozers on the beach [illegible] with [illegible]. The [illegible] was [illegible] with [illegible]. These [illegible], [illegible] the crane was [illegible] ved [illegible].

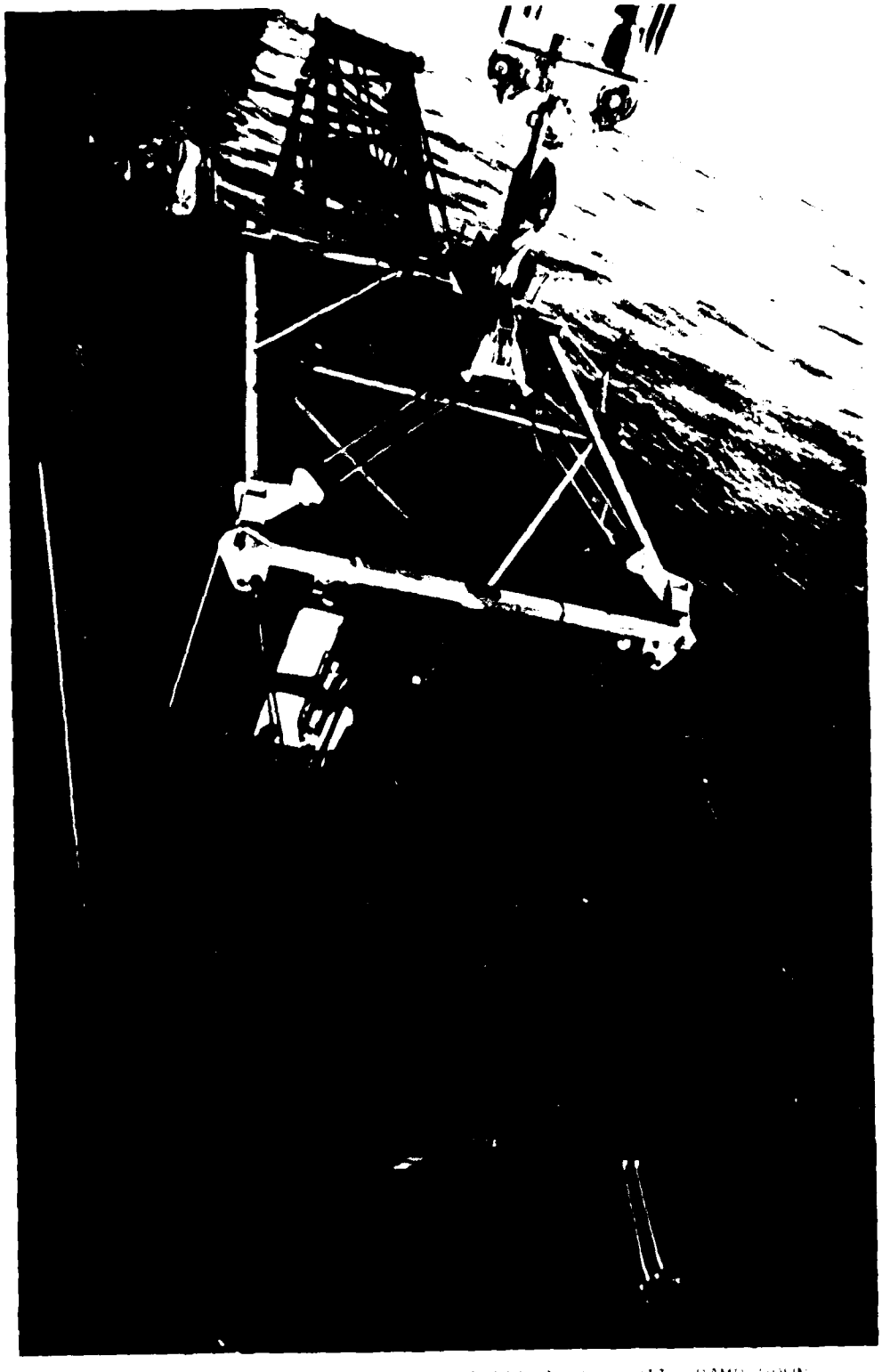
The majority of the time spent on the beach [illegible] the crane [illegible] involved [illegible] of the boom, counterweight, [illegible] and out-rigger floats and reeving the wire, components that are normally [illegible] commercial and military [illegible]. It required about [illegible] the crane [illegible] so that the crane could operate over the rear of the crane carrier where its lift capability would be greater than over the [illegible] breakdown of the time required to make the crane ready is contained in Table [illegible].

TABLE 4

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	N.A.	N.A.
[illegible]	[illegible]	N.A.	N.A.





[illegible] RAMP BEING LAUNCH[illegible] WITH RAMP DOWN

[illegible]

[illegible]

[illegible]

- [illegible]

- [illegible]

- [illegible]

- [illegible]

[illegible]

[illegible]

9125 Crane

The LCM8 carrying the Army 9125 crane to shore had no difficulty underway despite a pronounced list. The LCM8 grounded on an off-shore sandbar an hour before low tide. A LARC-V from the Naval Beach Group detachment assisted it in backing off. The LCM8 then waited for the tide to come in, and some 5 hr later made a second attempt. Again the LCM8 was stuck on a sandbar. This time cables were passed from bulldozers to the landing craft. With a hard strain on the lines the LCM8 was pulled over the bar and into the deeper water nearer the shore. From there it was successfully beached.

Bulldozers then graded a ramp for the crane to use in coming ashore. Momat was unrolled onto the graded ramp and, some 30 minutes after the LCM8 had been pulled across the sandbar, the crane was ready for moving ashore. In moving out of the LCM8 onto the mat, the crane got hung up on the after end of its carrier. By using an outrigger to jack itself up, the crane freed itself and moved onto the beach with no further difficulty. No difficulty was recorded in assembling the crane's counterweights, attaching the boom sections, and reeving the cables. These operations were accomplished during the night so that the crane was ready for operations before the first landing craft arrived the next day.

Sideloader

The LCU carrying the sideloader also had to be assisted by bulldozers in landing. It came ashore on the same tide as the LCM8 carrying the 9125 crane. After moving ashore out of the LCU, the sideloader overran the Momat matting and got stuck in the sand. Bulldozers assisted and got it back on the Momat. In another occation it got stuck crossing a narrow gap between Momat strips. This time it used its outriggers to elevate its tires so that beach matting could be placed under them and then it was freed.

CONTAINER THROUGHPUT OPERATIONS

General

In the second phase of the pretest, which involved container throughput operations, the TCDF was used exclusively to discharge containers from hold and deck stowage locations aboard the TRANSCOLUMBIA to various types of lighters, including LCU, LCM8, LARC-XV, LARC-LX, BC barge, and causeway ferry.

Four methods were used to unload containers from lighters:

- 140-ton crane on jacked-up B DeLong to off-load all lighters and load containers on milvan chassis.
- 300-ton crane at the high waterline primarily to off-load LCU and LCM8 craft. It was used to also off-load amphibians and to transfer loaded containers onto milvan chassis.
- 140-ton crane in the marshalling area to unload amphibians.

- Frontloader to off-load containers from a causeway ferry onto milvan chassis.

These subsystem elements were not used concurrently due to the small quantity of test cargo available (20 milvans and 1 40-ft van). Nevertheless, the pretest was the first opportunity in 4 years that a container throughput exercise had been attempted. Data and training on the new Army equipment were needed. It was also the first time in 4 years that a container marshalling area operation was conducted and, although the activities there were relatively slow and simple, the same data and training opportunities existed. Documentation and movements management also played a part in this phase with some limited use of the mobile CPS van.

To be representative of military cargo shipped in containers, the containers were weighted with dummy cargo. Figure 8 shows the weight distribution of the containers used.

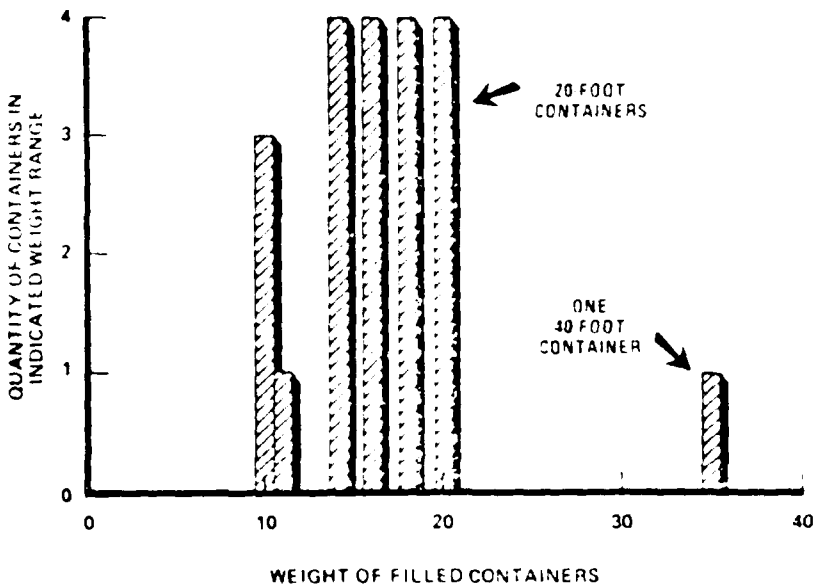


FIGURE 8. DISTRIBUTION OF CONTAINER WEIGHTS (20 and 40-FT)

Temporary Container Discharge Facility

Use of the heavy-lift breakbulk ship as a containership had two of recognized drawbacks. First, there were no cell guides to assist in attachment of the container spreader bar to containers in the hold. As a result, stevedores had to wrestle the spreader bar around over the tops of containers until it could be engaged with the corner fittings. Second, the TCDF had to

[illegible] near the ship's booms and kingposts. Both of these [illegible] cycle times. However, the time data gathered pro[illegible] information useful for main test planning.

During the pretest the containers were first completely off-loaded from the ship and retrograded. In some cases a container was backloaded and then without detaching the containers from the spreader bar the container was reloaded in the lighter. These latter iterations were disregarded since they had more training value than data validity. The TCOF working the TRANS-[illegible] off-loaded [illegible] and backloaded 16 containers. When the ship charter period was completed, a LASH barge was used briefly instead. No timings were made of these lifting and unloading events. There were considerable periods while working the ship in which the crane was inactive or delayed. When the [illegible] was operating, a cycle required approximately 10 minutes. Similarly, backloading containers to the ship required approximately 7 minutes each. Further discussion of these times is contained in Section III. Table 6 [illegible] characteristics of the TCOF.

TABLE 6

SUMMARY OF TCOF CHARACTERISTICS

[illegible] length (boom assembled)	130 ft
[illegible] width	60 ft
[illegible] weight*	656.2 LTons
[illegible] length	100 ft
[illegible] used	Heavy duty
weight of hook blocks (2)	1,450 lb each
hook operation	Double drum
wire	1 inch
[illegible]-part purchase	2 parts per hook
[illegible] operation during test*	15.[illegible]

* includes barge, crane, and crane foundations.

Crane at Beach

Operations with the 6250 crane at the water's edge commenced the afternoon of [illegible] November. The first day's activities consisted of discharging only five LASHs during a period of approximately 1[illegible] hr. Operations had commenced just 45 minutes after low tide, so it was not possible to land LCU's, LCM's, or barges close enough for the crane to reach them. Therefore, to obtain some crane use, amphibians were employed instead.

The next day, there was a morning high tide (0854) so retrograde operations were possible. One LCM was beached, backloaded with four containers, and retracted in 44 minutes. The average cycle time per container was 19 minutes 4 seconds. Poor weather was being experienced at the beach so the next LCM was loaded with only two containers before it was retracted after 22 minutes. After that the 6250 crane practiced loading and unloading LARC-V's and trucks. Gusts up to 40 knots were experienced which caused difficulties for beachmasters.

On the last day of beach operations for the 250-ton crane, approximately 1 hr after high tide, a LASH barge was grounded within the crane's reach and four containers were unloaded at an average rate of 5 3/4 minutes each. The barge was subsequently brought in at low tide and one container was off-loaded.

[illegible]

The second [illegible] beach unloading system to be experimented was the 11-ton [illegible] DeLong pier. The DeLong with the crane aboard was towed to the [illegible] by tugs and positioned at the beach using [illegible]. Installation began [illegible] workers schedules normally followed a [illegible]-hr routine since the [illegible] day.

The DeLong was brought in approximately 1 hr before high tide and [illegible] aground. 45 minutes later all its caissons (piling) had been lowered. There was no activity the next day and the third day, November, after some [illegible] setting, the ramps to the DeLong were lowered from the DeLong to the beach. However, by the end of that day some additional alignment was required and the fourth day was spent aligning the ramps. Then, because a [illegible] was needed onshore of the 4-ft high DeLong ramps, an assault vehicle [illegible] bridge (AVLB) ramp was installed. By the end of the day, after approximately [illegible] hr of activity, spread over 4 days, the DeLong pier was ready for [illegible]. Appendix E provides a detailed description of the installation [illegible] subsequent crane operations.

Operationally, the DeLong handled approximately [illegible] containers during the [illegible] phase. The first day of operations was mostly one of practice [illegible] onto landing craft and once onto a truck. The morning of the next day, November, the hydraulic spreader was found damaged and a manual spreader had to be obtained. Consequently, the opportunity for operations during the high tide period was lost. During the low tide period initially some practice was accomplished by loading and off-loading trucks. Then two LARC-V's were sent with containers to the DeLong and these were unloaded onto the pier. One container was later retrograded via a LARC-V.

The next day, November, was more active. In the morning during high tide two LCM's were loaded with three retrograde containers. Then three LCM's and a BC barge were moored for off-loading a total of 16 containers. In the afternoon amphibians replaced landing craft in order that operations could continue during low tide. Two LARC-V's were off-loaded and two others were backloaded.

[illegible]

The last day, [illegible] November, a LASH barge was moored at high tide to the [illegible] with four containers. At some point the LASH barge was [illegible] required welding a plate over the hole. The welding was done at low tide with the barge grounded and the hole exposed.

[illegible]

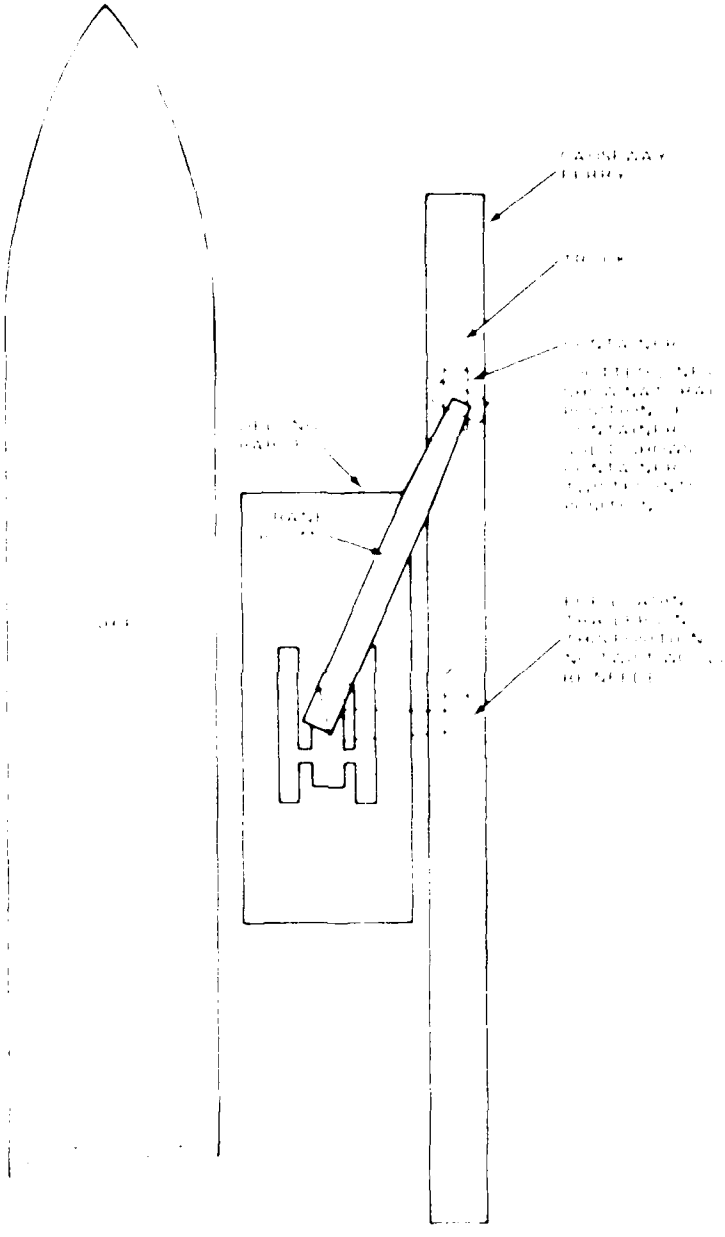
The causeway ferry was used twice during the operation. The first [illegible] "shuttling" in which containers were placed on milvan chassis [illegible] the causeway. The second employment a day later called for placing the [illegible] on the causeway. The four-section causeway used in both [illegible] two LCM causeway tender boats.

[illegible] November the first operation was begun by loading three milvan trailers at the beach east of the Belong pier. Bulldozers constructed a sand ramp to the causeway. As soon as the ramp was prepared, three M-54 trucks with the trailers individually proceeded onto the causeway. Each truck-trailer unit was situated on a separate causeway section. The most seaward section, the one between the two tender boats, was left vacant. None of the vehicles were [illegible]. The causeway retracted from the beach without difficulty at 1 hr past high tide and proceeded towards the ship.

At [illegible] the first milvan was lifted from the deck of the [illegible]. After [illegible] trying to position the container on the platform trailer, the attempt was aborted. The problems were:

- The relative motions of the [illegible] and the causeway.
- The twist angle (approximately 45 degrees) needed to properly align the container with the trailer (see Figure 9).
- The limited deck area for line holders.
- The target is small—even when there is no relative motion, as on dry land; it is not easy to position a container directly onto the container fittings of this type of trailer without repeated tries.

The second attempt on a different trailer was successful, requiring [illegible] minutes. The first lift attempted had been to a trailer spotted on the causeway well forward of the [illegible] crane. The second lift loaded a trailer which offered a better angle to the axis of the boom. (Dotted lines, Figure 9.) The



[illegible] there were [illegible] about 11 minutes. But [illegible] the two [illegible] attempt to [illegible] the third container was [illegible] minutes.

The causeway [illegible] its approach [illegible] after low tide required about [illegible] minutes. [illegible] the landing onto the beach required approximately [illegible] minutes.

In the [illegible] causeway [illegible], the pillars were loaded from the ship directly [illegible] the causeway. All [illegible] lanes across the causeway. The causeway [illegible] 21 ft wide and the container [illegible] ft long. There was some [illegible] the [illegible] the container [illegible] degrees to position them. The [illegible] causeway, the one that would beach first was left vacant [illegible] still [illegible] appropriate for beaching. The pillar was positioned [illegible] the [illegible] in the third position. The [illegible] sector was [illegible]. The causeway nearest to the [illegible], was loaded with five [illegible].

[illegible] the beach, the causeway had [illegible], taking a perpendicular [illegible] bulldozers went out as far as [illegible] assist, but were initially [illegible] perpendicular, the tide was receding. After [illegible] the causeway [illegible] at a 15-degree angle to the beach, but the bulldozers were able to [illegible] the causeway [illegible] after about [illegible] minutes. It remained [illegible] within an hour [illegible] wide [illegible], at 14:[illegible] when it was [illegible] with the assistance of two bulldozers.

Once the causeway was secured by a bulldozer winching cable, the five [illegible] were rapidly off-loaded by a frontloader directly to waiting trucks. [illegible] required approximately [illegible] minutes.

[illegible]

[illegible] processing can be interfaced with [illegible] was employed for the [illegible] time in [illegible] was the [illegible] pretest. The mobile van interfaced [illegible] provided timely documentation essential to the causeway [illegible] transferring the beach complex but it was not [illegible]. [illegible] computer was [illegible] needed [illegible] manifests, its range tables, and [illegible] movement documents [illegible] the mobile unit. [illegible] equipment [illegible]. It was not directly tied [illegible] the van [illegible] with the supporting computer. Therefore, the pretest provided a practical try-out of the [illegible] component and helped [illegible] before the main test.

Mobile van equipment which had been available on the [illegible] pretest [illegible] memory unit [illegible], a card reader, printer, a filing cabinet, and a desk. For this pretest one desk was taken out and a keyboard, a [illegible], and another filing cabinet were added. Figure 16 shows the van's current interior layout.

[illegible]

[illegible] and receipt [illegible] was not placed [illegible] punched cards were used [illegible] the discharge tables [illegible] the test [illegible] processing. With the [illegible] it was possible to prepare cards that were [illegible] wire reports or cargo [illegible] the test.

[illegible] which included tables from several [illegible] the [illegible] was [illegible] However, the [illegible] of [illegible] the [illegible]

[illegible]

- [illegible] particular [illegible]
- [illegible] stability [illegible]
- [illegible] the [illegible] is required.

[illegible]

This position proved to be in error— the pins should have been at the other end. As the lift began the error became all too evident. The center of gravity of the crane assembly began to swing to a position under the suspension point, with the crane at a strong tilt. (See sketch, Figure 12.)

The tilt, however, was accommodated in the loading phase, although it did create some delays. While the ship was underway or prior to the initiation of ship unloading, the lifting frame should have been modified. The decision not to correct the location of the pins resulted in additional delays during off-loading operations.

Comparison of Crane Readiness Times for Different Assembly Configurations

The disassembly of the 300-ton capacity crane to a tactical configuration for deployment takes less time than an administrative (detailed) disassembly would for deployment on a ship with a less capable boom. This, of course, is also true for crane reassembly once the crane has been shipped to the objective area. Table 7 illustrates the differences in deployment times for the two disassembly operations. The table is based upon judgments regarding which delays are typical of real operations, which operations can be done concurrently, and the like.

In the test the 6250 crane was made ready from its minimum disassembly configuration in a shorter period than required when fully disassembled as in previous pretests. The turnaround of the crane on the beach makes a precise comparison of the times for the two get-ready operations difficult. Even after subtracting administrative delays, it is not possible to make an exact comparison.

The comparison shown in Table 7, then, should be interpreted as showing a general order of magnitude of difference in the times that could be expected between the two assembly operations, if two otherwise similar operations are compared. The table indicates what times were included and excluded in the comparison.

Looked at in total, the savings in time by moving the crane in its minimum disassembly configuration is about 2 days. This difference depends on the assumptions made. These assumptions concern such matters as:

- Whether the loading bottleneck will be the heavy crane (in effect, Table 7 does assume this);
- The order of unloading from the ship (the components for the 9125 and 6250 cranes are assumed to have priority for unloading); and
- Whether the assembly of the 9125 crane could be done concurrently with the discharge of the 6250 crane components from the ship (as assumed in Table 7).

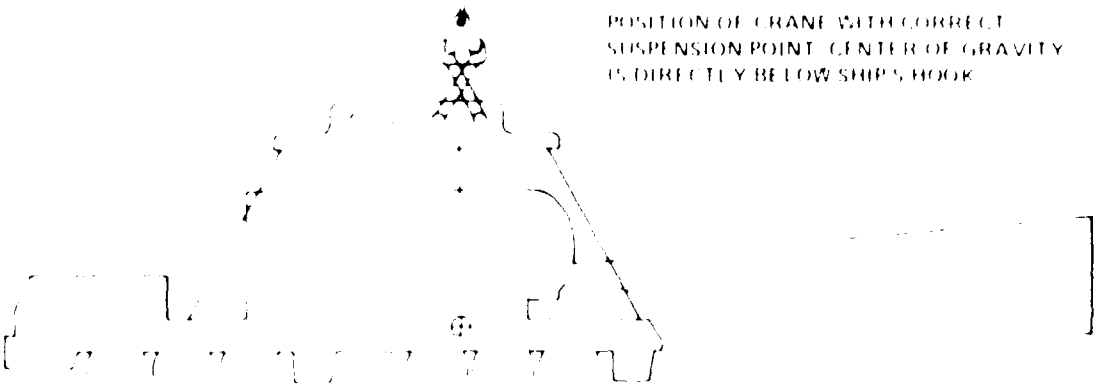


FIGURE 1. SCHEMATIC SHOWING CRANE TILT

Tilt resulted from incorrect selection of holes
in top member of hoist rig.
(Not to scale.)

TABLE [illegible]

[illegible] OF TIMES FOR DEPLOYING HEAVY CRANE

Administrative, Disassembled 6250 (as in previous pretest)		Minimum Disassembly (as in Heavy-Lift Ship pretest)	
Disassembly and Loading Times			
Disassembly and mobile loading (as reported in [illegible])	[illegible] hr	Partial disassembly and mobile loading of booms and crtrwts.	11 hr
Transit time [illegible]	[illegible]	Transit time	[illegible]
Loading times [illegible] crane, [illegible]	[illegible] hr	Single heavy lift	[illegible] hr
Loading times [illegible] counterweights [illegible]	[illegible] hr	Counterweights, booms, etc.	[illegible] hr
	[illegible] hr		[illegible] hr
Off-Loading Times (at objective area)			
[illegible]	[illegible] hr	Off-loading assembled crane	[illegible] hr
[illegible]	[illegible] hr		
[illegible]	[illegible] hr		
Minimum total off-loading	[illegible] hr		[illegible] hr
Movement to Shore			
Transit time to last halt; transit time while movement with off-loading	[illegible] hr	Ship-to-shore transit time	[illegible] hr
Transfer time at shoreline, time to last halt; transit time while movement with off-loading	[illegible] hr	Transfer time	[illegible] hr
	[illegible] hr		1.0 hr
Assembly Times (based on best estimates)			
Reassemble 9125 crane	13 hr	Install operator's module	1 hr
Reassemble 6250 crane	20 hr	Assemble booms and counter-weights	3 hr
	[illegible] hr		4 hr
Total times	[illegible] hr		[illegible] hr
Difference attributable to degree of disassembly . . . . [illegible] hr			

[illegible] of the assumptions listed are not realized in a contingency and the listed components of the deployment times are different from those shown in the table, it is [illegible] that there would still be a definite advantage. This advantage would be on the order of two days if the more fully assembled crane configuration is possible for deployment. This advantage is gained by the use of a heavy-lift ship that can load and discharge the crane (tactically disassembled) and the type lighter needed to transport the 6250 crane (in its more nearly operational configuration) to shore.

The decision on which configuration to use in moving the 6250 crane will be [illegible] by the shipping available. Assuming that in a future emergency heavy-lift ships will have other cargo competing for sea transport, a comparison like that shown above would be of value in making a decision on shipping allocations. [illegible] shipments must be delayed until an appropriate [illegible] capability has been established in the objective area.

[illegible] the ship allocation considerations are the lesser risks in the transport of the heavier, fully assembled crane versus the risks of reassembly after it has been detail-stripped. Detail stripping is necessary to permit the crane being carried on a ship that can load and off-load components weighing only 30 long tons or less. The detailed disassembly and reassembly requires the need for more highly skilled and experienced personnel and [illegible] the risk of not being able to assemble close fitting components that may have been damaged in transit.

Moving Cranes Ashore from Ship

Transit of the cranes from the ship to the vicinity of the beach aboard their respective lighters, the LCU and the LCM-8, presented no problem. [illegible] to the beach presented real difficulties at low tide and [illegible] even at high tide. Thus, the sandbars were a considerable deterrent [illegible] in the operations at Green Beach, Ft. Story. For the [illegible] operations amphibians are, of course, an answer to sandbars and [illegible] gradient problems. However, during the deployment phase and shipboard movement, even the largest amphibious vehicle (the LARC-15) is not capable of lightering either crane. In any case, these vehicles are in short supply and are themselves difficult to deploy. Thus, for deployment with landing craft, beach gradient and sandbar problems appear to need further study, in the light of the potential problems they present to equipment deployment, especially [illegible] equipment.

[illegible]

The use of the heavy-lift ship to deploy 140ft-class LCUs was reaffirmed as a tried and proven procedure during the pretest. However, the Navy's new 1646-class LCU which had been scheduled for loading was not because neither the ship nor the Navy had the necessary sling. As part of the charter agreement the ship is required to carry other LCU slings but no requirement has been levied for carrying a sling needed for this type landing craft. Since this is the predominant [illegible] in the Navy and the older Army LCUs will be phased out in favor of a craft similar to the Navy's, this shortcoming should be rectified.

From the point of view of the best use of the heavy-lift ship as a resource with severe limitations on the total quantities of equipment it can carry, its LCM capability is still most important. MSC has 16 ships that can carry LCMs, causeway sections, and, potentially, 80 barges, but it has only these two ships that can carry four LCM's each. An LCM is necessary for carrying a fully-assembled crane and it has a greater container lightering capacity that is relatively unhindered in improved beach operations. It also has capabilities to operate longer in heavy weather than other types of landing craft.

CAUSEWAY FERRY ASSESSMENT

The causeway ferry was the only non-amphibian lighter in the pretest that was able to function at any desired stage of the tide and could cross sandbars that hindered other landing craft. The reason for this is the shallow draft of the causeway, particularly its shoreward end when left unloaded. The shallow draft permits a close approach to the beach and its light weight forward permits the shore end to be pushed up on the sand toward dry land. The section at the shore end is, thus, literally a causeway leading out to the cargo-carrying sections of the ferry, which remain in deeper water. The total length of the four-section ferry used was 160 ft, although additional sections can be added increasing the length.

The operation in which the causeway was loaded with containers placed with their longitudinal axes athwartship was in the overall more efficient than the operation in which the containers were placed on milvan chassis. This was because much greater accuracy was required to land the containers on the milvar chassis, which proved to be difficult and time consuming.

For the operation without trailers the containers were placed directly on the causeway. The possible disadvantage is that loaded in this manner there is a greater chance the containers are likely to get wet in other than a calm sea. Also, the containers had to be positioned athwartship for unloading by a frontloader on the beach. This required tagline handlers to turn the suspended containers 90 degrees or more. This was accomplished, however, without great difficulty. Since the containers are 20 ft long and the causeway is 21 ft wide, there is little room along the edge of the causeway for tagline handlers to maneuver the swaying containers.

For unloading the ferry on shore the frontloader was very effective. Using only one unit was slow since the same frontloader was also used to position each container on a trailer. The five containers were unloaded in just over 3 hr, or approximately 65 minutes each. If two front loaders had been available this time could have been greatly reduced. An empty loader could move onto the causeway immediately after its predecessor left with a load. Another way to reduce the causeway unloading time, at the expense of some double handling and possible truck delay, would be to have the single frontloader drop each container at a point near the causeway until it was unloaded. Then the frontloader would load trailers until another loaded causeway ferry was beached.

The causeway ferry provides a beaching capability where landing craft are not able to function. Its use should be considered by the JTF in its lighterage mix during periods of the main test when landing craft are unable to beach.

[illegible]

[illegible]

[illegible]

[illegible]

TABLE A.
[illegible] DATA

[illegible]	
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] [illegible]

[illegible] [illegible]

[illegible] [illegible]

[illegible] [illegible]

APPENDIX B

[illegible]

[illegible]

The [illegible] the B [illegible] barge [illegible] started. The barge, with [illegible], was [illegible] the working site [illegible] (see Figure B-1). [illegible] the barge was [illegible] ashore with [illegible]. The barge [illegible] with the [illegible] the high water line. Two bulldozers attempted to [illegible] forward end [illegible] the high water line. [illegible] winch the barge further ashore, but were unsuccessful. The [illegible] the bulldozers [illegible]. The barge was then raised [illegible] the [illegible] with [illegible] recorded.

The [illegible] equipment was [illegible] the barge [illegible]:

- [illegible] assembled [illegible] crane
- [illegible]
- Two trailers, one an air compressor, the other a generator
- Assorted lashing equipment
- Two [illegible] ([illegible] ft x [illegible] ft x [illegible] ft)

---

[1] A rough calculation shows that the average draft was [illegible] ft.

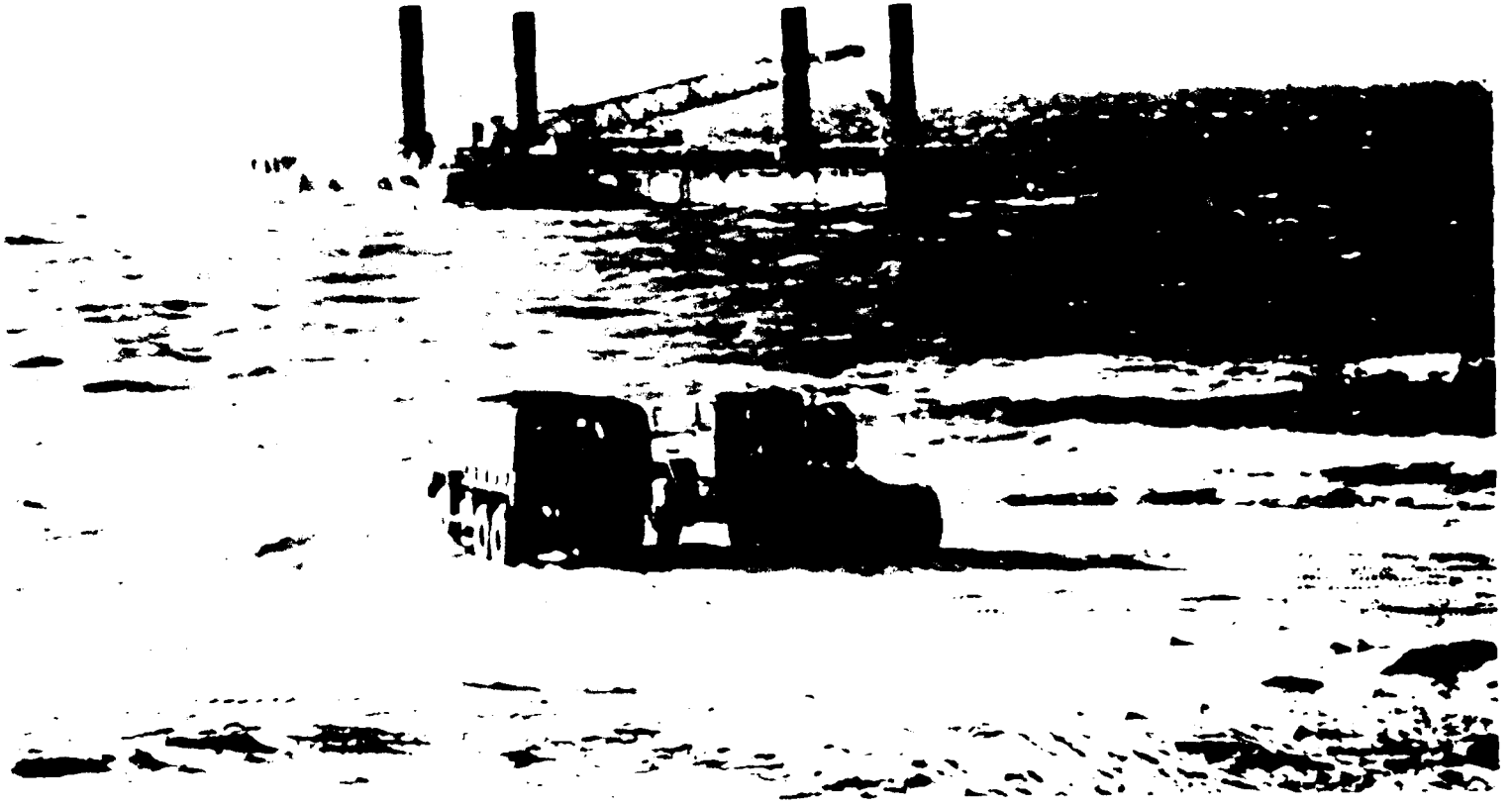


FIGURE B.1. B DELONG PIER ENROUTE TO RED BEACH

After a [illegible] with no activity (November 2[illegible]), work began on positioning the [illegible] half-inch steel plating, mounted on rail-ties, was positioned in front of the barge on the beach to act as a foundation for the beach end of the ramp when the ramp had been winched off the barge. Concurrently, a metal lip at the shore edge of the barge was burned off with an acetylene torch to facilitate off-loading the ramp. Holes were cut in the ramps for cable hooks so that each ramp could be winched off with two bulldozers.

During the operation one bulldozer winched a little faster than the other, [illegible] one side motion of the first ramp. As a result, the cable hole on the right side was distorted and the line came loose. A new hook-up was made [illegible] and the ramp was winched off the barge without further incident. The ramp was pulled to a position with one end on the beach and the other still overlying the barge platform by approximately 1½ ft.

The beach area was again graded and the beach end foundation timbers were realigned. The second ramp was winched off the barge. Alignment with the left ramp was assisted by an additional bulldozer. The winching this time took [illegible] minutes. Lessons learned on the first ramp were evident during the winching operation on the second.

Next the barge was raised further on its scissors to allow a better angle for the ramps to the pier support beams. The supports, or ledges, are located on the vertical face of the barge end. They are at a sufficient distance below the barge deck that when the ramp is in place, its top is flush with the barge deck.

The 100-ton crane then lifted the barge end of the left ramp. At the same time two bulldozers began pulling the beach end of the ramp until the barge end was clear of the barge platform. The crane then lowered the ramp onto the support ledge. The ramp was then secured. This operation took only [illegible] minutes each for both ramps. An additional bulldozer was used to push the right ramp against the left. When both ramps were in place, the right side at the beach end was approximately 1 ft higher than the left. This was the situation when [illegible] ceased at the end of the working day.

The next morning, November 4, two [illegible]-ton cranes attempted to lift the beach end of the left ramp in order to shore it up to the height of the right ramp. The weight of the ramp was estimated at 45 tons. By lifting only one end, the total lift was only about 1½ tons. Two attempts to lift the ramp were unsuccessful, and the [illegible]-ton cranes were secured. However, two bulldozers, working in unison, were able to lift the end of the ramp. Shoring was installed and a proper horizontal alignment achieved.

The left ramps were properly positioned and secured to the pier, a [illegible] ramp was constructed by two bulldozers. Immediately thereafter, an Assault Vehicle Landing Bridge (AVLB) positioned its scissored landing bridge over the [illegible] ramp to the pier ramps. No problems were encountered with the AVLB. Total time for the AVLB operation was 4 minutes.

Final beach grading was completed at 1600 and the pier was ready for operations. Total elapsed working time for the ramp emplacement was

[illegible]

- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] a lunch break between 1145 and 1330. [illegible] was alongside. Two milvans were on the pier [illegible] the marshalling area. These milvans were ultimately [illegible] the pier approximately 4 hr after being [illegible]

[illegible] resisted at two loaded LASH's docking and dis-[illegible] two additional milvans were then loaded into these [illegible] were secured.

[illegible] December, the A-LF scissor cart was removed. [illegible] were substituted, together with Morgat for [illegible] this time seas were rough with wave heights esti-[illegible] knots.

[illegible] at the pier but because of the bad conditions [illegible] The craft would ground out wherever it rode [illegible] attempts to lift the milvan out of the LASH [illegible] were postponed.

[illegible] the pier at 1109 after some difficulty with the [illegible] departed. Operations were called off [illegible] high wind and seas.

[illegible] milvans were rapidly loaded into a LASH barge. [illegible] prepositioned on the pier before the barge moored at [illegible] After the barge was loaded, two LCM8s arrived. [illegible] with a container and the other was empty. The container was [illegible] craft three times. Average cycle time was 5 minutes [illegible]

[illegible] was observed during the lunch break. At 1400 a LASH barge [illegible] welding repairs. The repairs continued throughout the [illegible] 1 ft x 1 ft plate was welded over a hole inflicted above [illegible] took up one whole side of the pier and restricted [illegible] the other side.

[illegible] the last two LASH-LVs were loaded with con-[illegible] There were no significant difficulties.

APPENDIX C

TEMPORARY CONTAINERSHIP DISCHARGE FACILITY (TCDF)

GENERAL

The Heavy-Lift Breakbulk Ship Pretest helped provide data on crane capabilities and limitations in the important area of Temporary Containership Discharge Facility (TCDF) operations. This pretest was the first opportunity to use the Army's new K250 (300-ton lifting capacity) crane on a floating B [illegible] barge for the discharge of containers from the holds of a ship. In addition, it was the first time military operators were used to conduct TCDF-containership operations. Although there were some artificialities due to the lack of container cell guides, the need to top the crane boom to clear the [illegible] booms and kingposts, and the limited opportunity for establishing a rhythm of operations, valuable data and insights were gained.

DISCUSSION

As of this report, it is uncertain what capacity load can be safely lifted by a mobile crane mounted on a floating platform when the crane (and platform) moves in response to waves or to the load. That is, when waves are moving the platform, different kinds of stresses occur in the crane from those experienced on solid ground. Accordingly, the crane lift capability is reduced to allow for such extra or different stresses; in other words, the crane must be derated for operations in a seaway. It is possible that the point may be reached where the crane on the barge cannot safely hoist the heaviest loads. In that case, in attempting a lift there is the possibility of a catastrophic failure to some component of the crane.

[illegible]

[illegible]

[illegible] illustrates the clearances and reach dimensions that [illegible] the greatest in which the heavy-lift ship was acting as a sub-[illegible] containership. A reach to the centerline of the ship is necessary [illegible] hatch covers on many containerships. The designers of containerships, [illegible] the rule that a hatch cover can be no heavier than the [illegible] container [illegible] be lifted from the holds of that ship. This limits the [illegible] lift requirement to a maximum of 30,000 lb or the equivalent weight [illegible] container and that of a spreader bar needed to lift it. [illegible] with [illegible] lift containers hatch covers weigh considerably less but a [illegible] be [illegible] the maximum requirement.

The heavy-lift ship has a beam [illegible] ft. Half of this distance, the [illegible] the ship's centerline, [illegible] the tender between the barge and the [illegible] the half beam [illegible] the barge provides a crane reach requirement [illegible] per the half beam of the heavy-lift breakbulk ship. This distance [illegible] in Figure [illegible]. It may be noted from Table [illegible] that, under the [illegible] current operating guide for this distance, a hatch cover or [illegible] container [illegible] be lifted. In fact, there is a [illegible] [illegible] sea state [illegible]. This is approximately the lift and [illegible] the [illegible] for the type ship chartered by the [illegible] [illegible] there are [illegible] seas and a relatively light spreader [illegible].

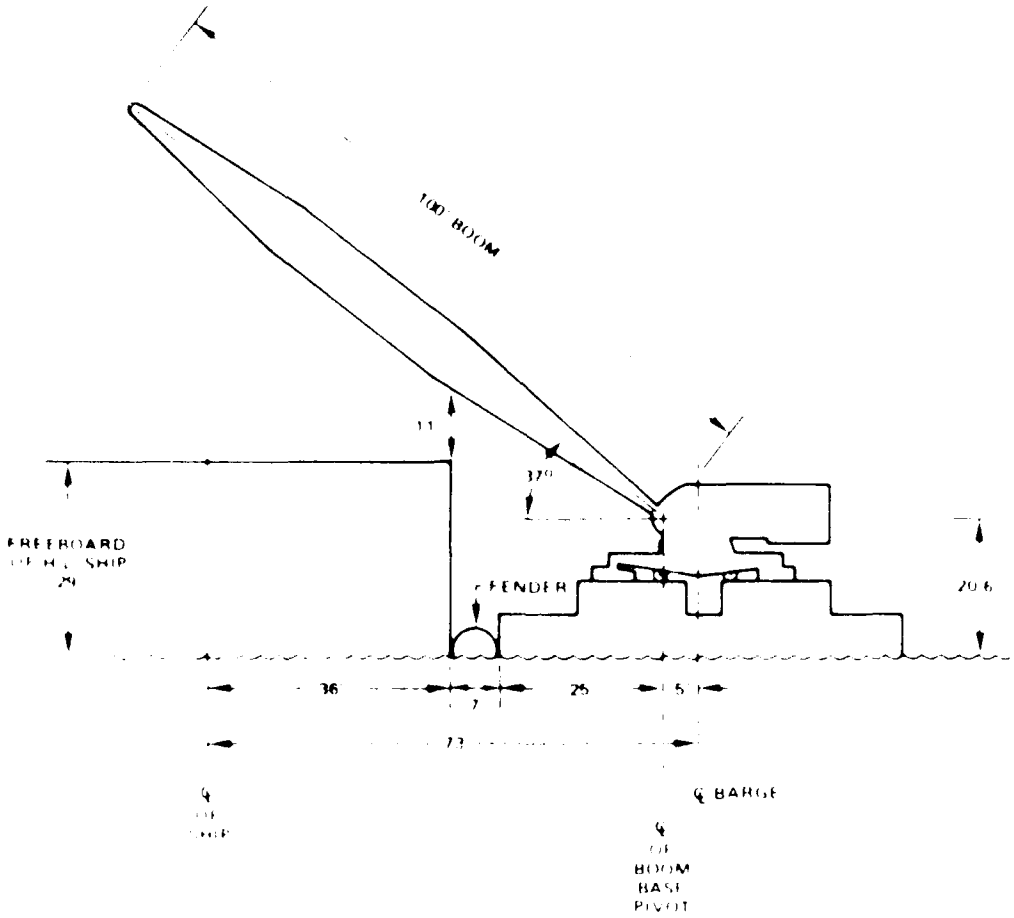
[illegible] containerships [illegible] have beams of approximately 95 ft, the [illegible] the centerline [illegible] suitable for ships this wide that [illegible] containers [illegible] the centerline, the reach would have to be at least [illegible] wide, under current operating criteria the crane would not be able [illegible] designed for lift containers with [illegible] the lift would be within the limits of the derated [illegible].

[illegible]

The heavy-lift breakbulk ship tender was conducted using a lift [illegible] the [illegible] from it, of course, the more it weighs and [illegible] lift is reduced. However, there are instances [illegible] the use of a larger boom. The [illegible] requirements, ship stability, and [illegible]

The [illegible] of the lift crane used in the tender will, generally, [illegible] these containers from hatches forward, amidships [illegible] the barge, especially with respect to those containers near the centerline [illegible] little that a reach only to the centerline of the [illegible] necessitate frequent repositioning in order [illegible] the [illegible] near the centerline within the boom's lifting range.

[illegible] containership type chartered [illegible] with [illegible] the center of gravity of the hatch [illegible] the ship's centerline. Therefore, the reach will be [illegible] well within the [illegible] sea state capacity.



[illegible] CLEARANCE AND REACH DIMENSIONS FOR 6250 TC CRANE
[illegible] containership relation during heavy-lift ship [illegible].

A longer reach could also be beneficial in helping ship stability. This would result when the TCCF is capable of reaching across the ship's centerline [illegible] containers. Thus, with only one TCCF or CC working this would help the ship maintain a more even keel during the unloading process than if the containers were first removed from one side and then the other.

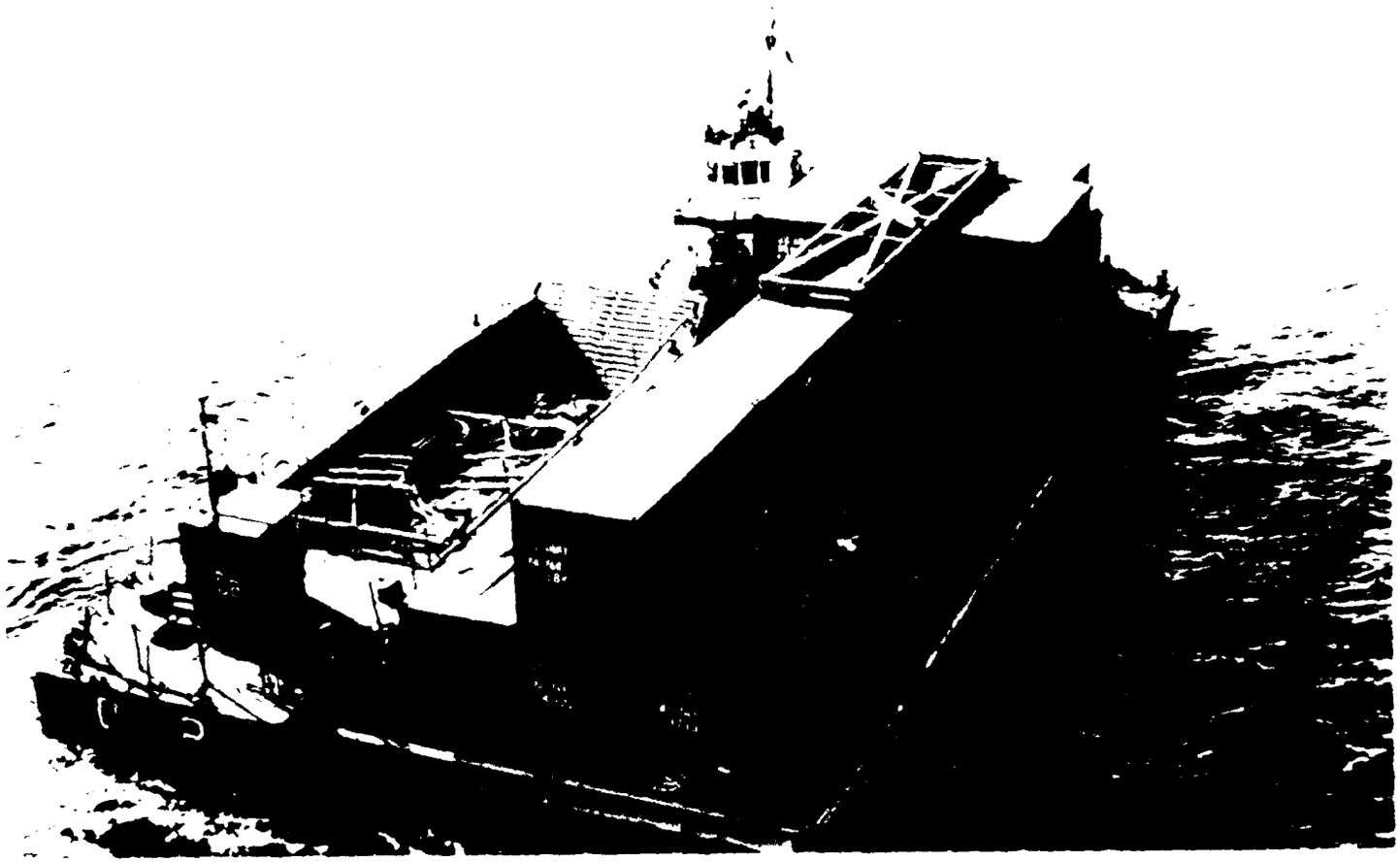
Another factor to be considered is the freeboard of the ship. For a containership with a freeboard greater than the heavy-lift breakbulk ship, a longer boom would be required. This is illustrated in Figure [illegible].

With the range of weights and vessel characteristics now known, more detailed planning for the configuration and operation of the 6250 crane or the [illegible] large type [illegible] can be done.

APPENDIX I

[illegible] SUMMARY OF USA, VA-DOT PROGRAM OF [illegible]

FIG RE [illegible]. S.S. TRANSCOLUMBIA [illegible] PRETEST. The S.S. TRANSCOLUMBIA, one of two heavy-lift breakbulk ships under long-term charter to the Military Sealift Command, was used November 2-7, 197[illegible], for the third LSTS pretest. The primary objective of the pretest was to load LSTS heavy and outsized equipment in a harbor, unload it from the ship at anchor in the open sea, and establish it ashore for the conduct of container throughput operations.



[illegible] Marine Corps [illegible] primary objective, established by the Services, was to conduct a comparative evaluation of [illegible] containers [illegible] an Army P [illegible] barge are being [illegible] [illegible]

FIGURE [illegible]. 40-FT CONTAINER. One 40-ft container was included in the load to provide data and experience in handling a 40-ft container which weighed [illegible] short tons.

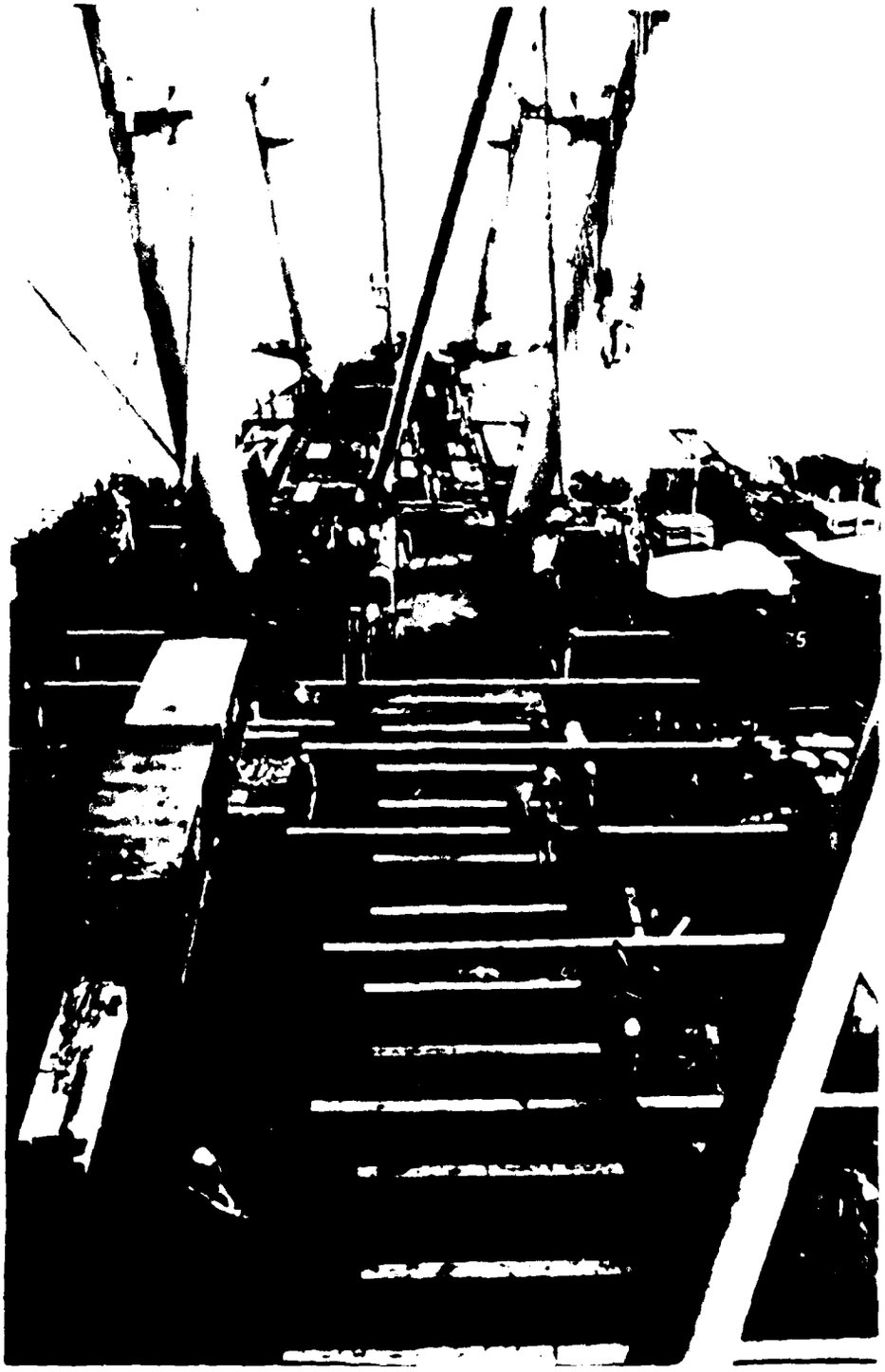


FIGURE [illegible]. DECK PREPARE[illegible]. Dunnage was laid on deck in preparation for the heaviest lift made in the [illegible] pretest program, a 14tf-class Army L[illegible]. Each of the two heavy-lift ships (the only heavy-lift ships currently in the [illegible] flag fleet) can carry four of these large landing craft. A 164t-class [illegible] could not be lifted because neither the ship nor the Navy had the necessary sling.

FIGURE D-6. BOOM MARRIAGE. To lift the 180-long ton LCU, a boom marriage of two 120-long ton capacity booms was made. This gives the ship a [illegible] long ton capability, although reportedly the ship has lifted and carried a [illegible] long ton tug.

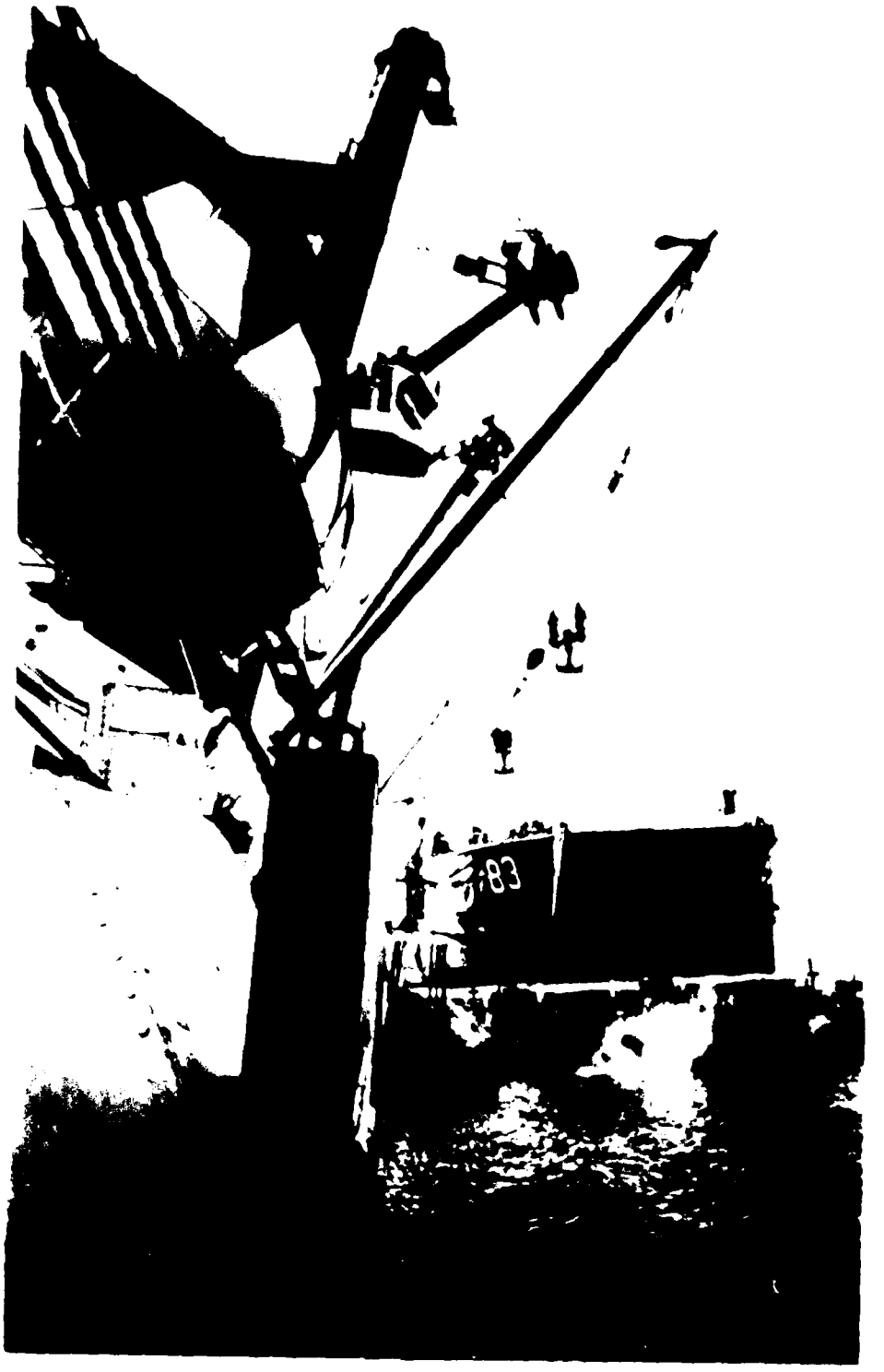


FIGURE [illegible] WITH EASE. The LCU lift, although infrequently accomplished, was made with relative ease. Military personnel acted as stevedores but the ship's [illegible] operated all machinery and directed the technical aspects of [illegible].

FIGURE [illegible]. SMALL LIST EXPERIENCED. During the LCL lift the ship did experience nearly an [illegible]-degree list; however, the ship was designed to take a maximum of a 12-degree list during loading. A counter-ballasting system is used for heavy lifts.

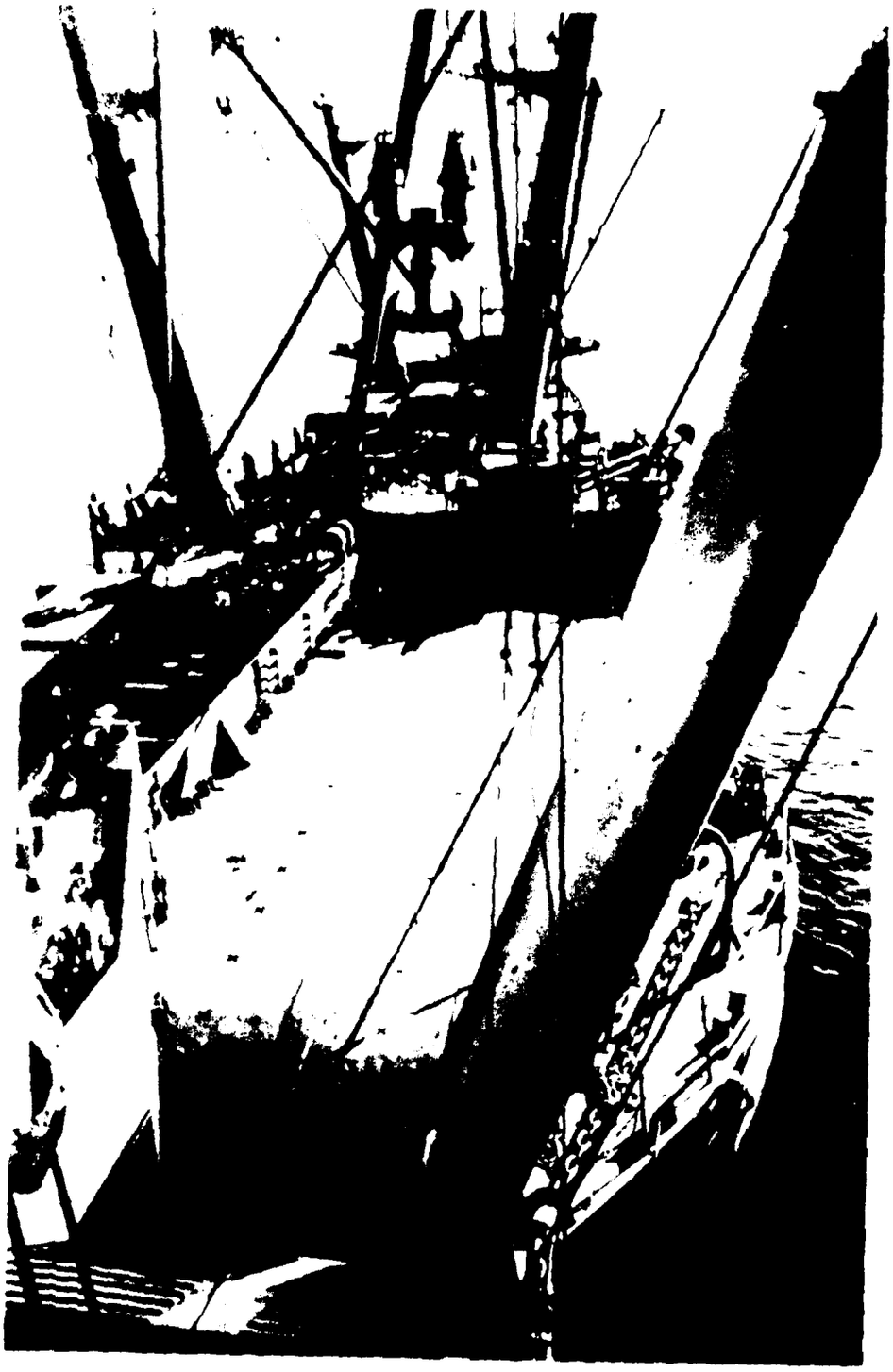
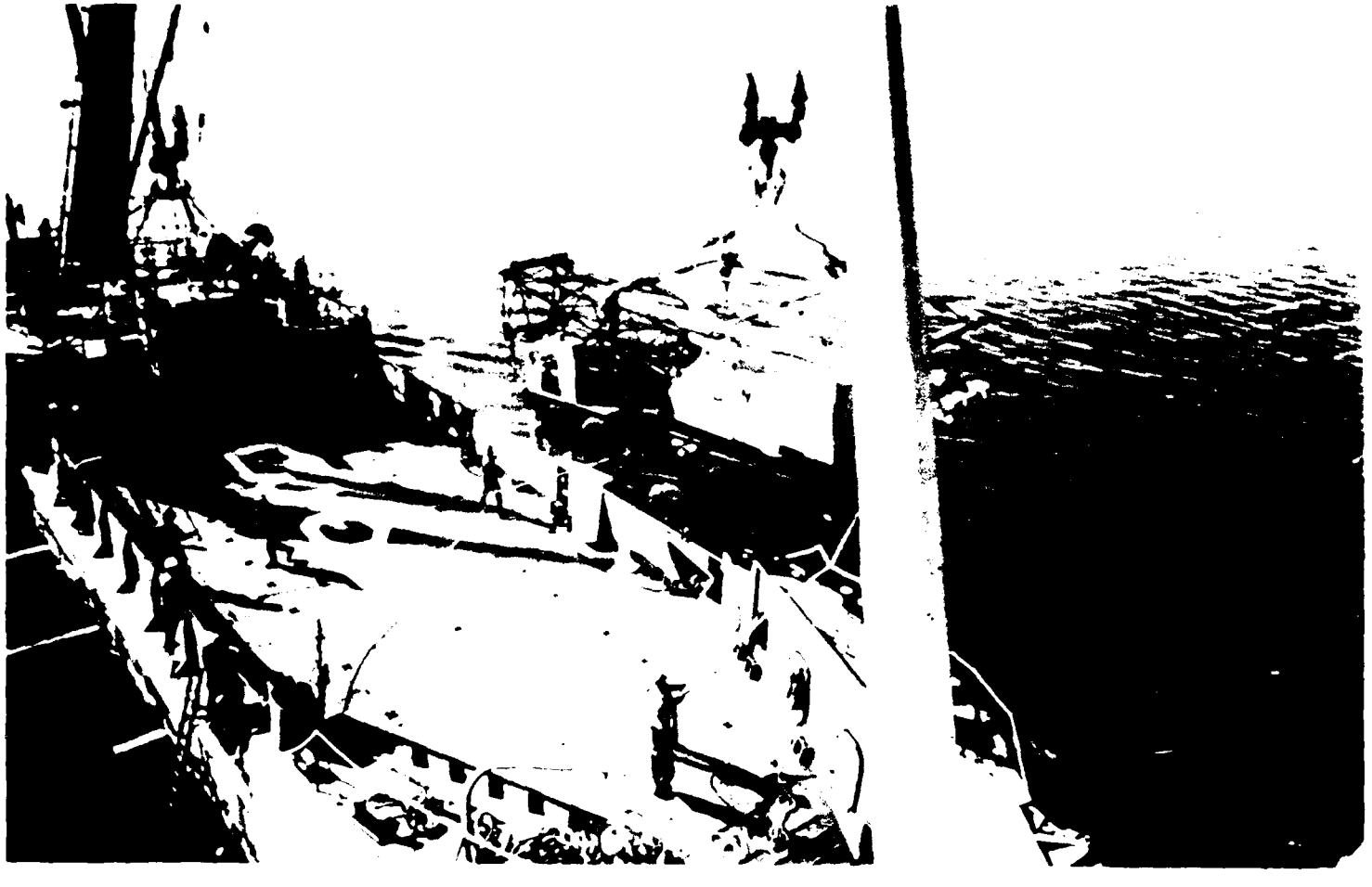


FIGURE [illegible] PREPARATIONS REQUIRED. No special preparations are required [illegible] for lifting. In this case the LC's mast was lowered [illegible] tension rack, but this proved to be unnecessary.

[illegible]



[illegible] wave state [illegible]

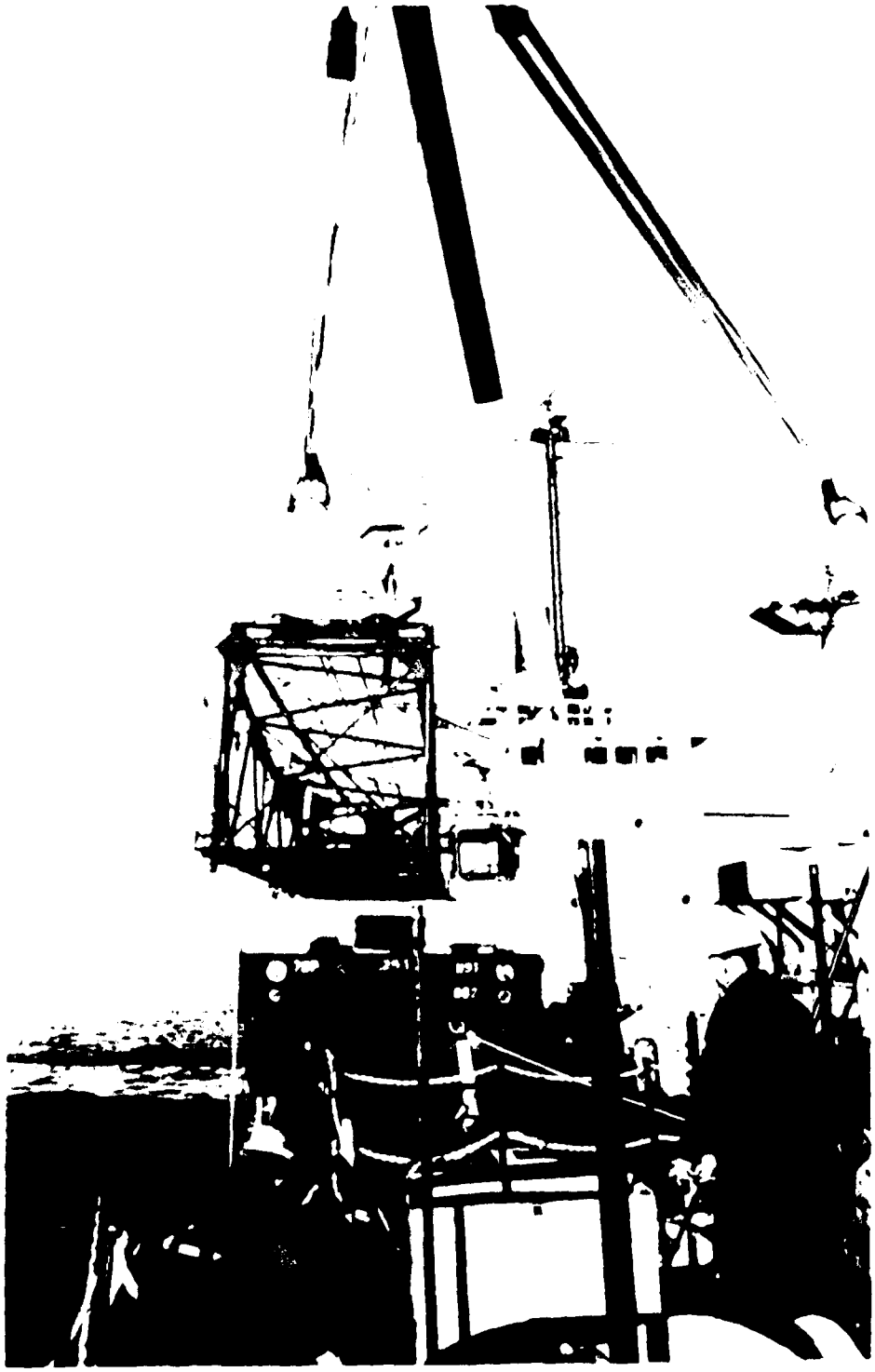
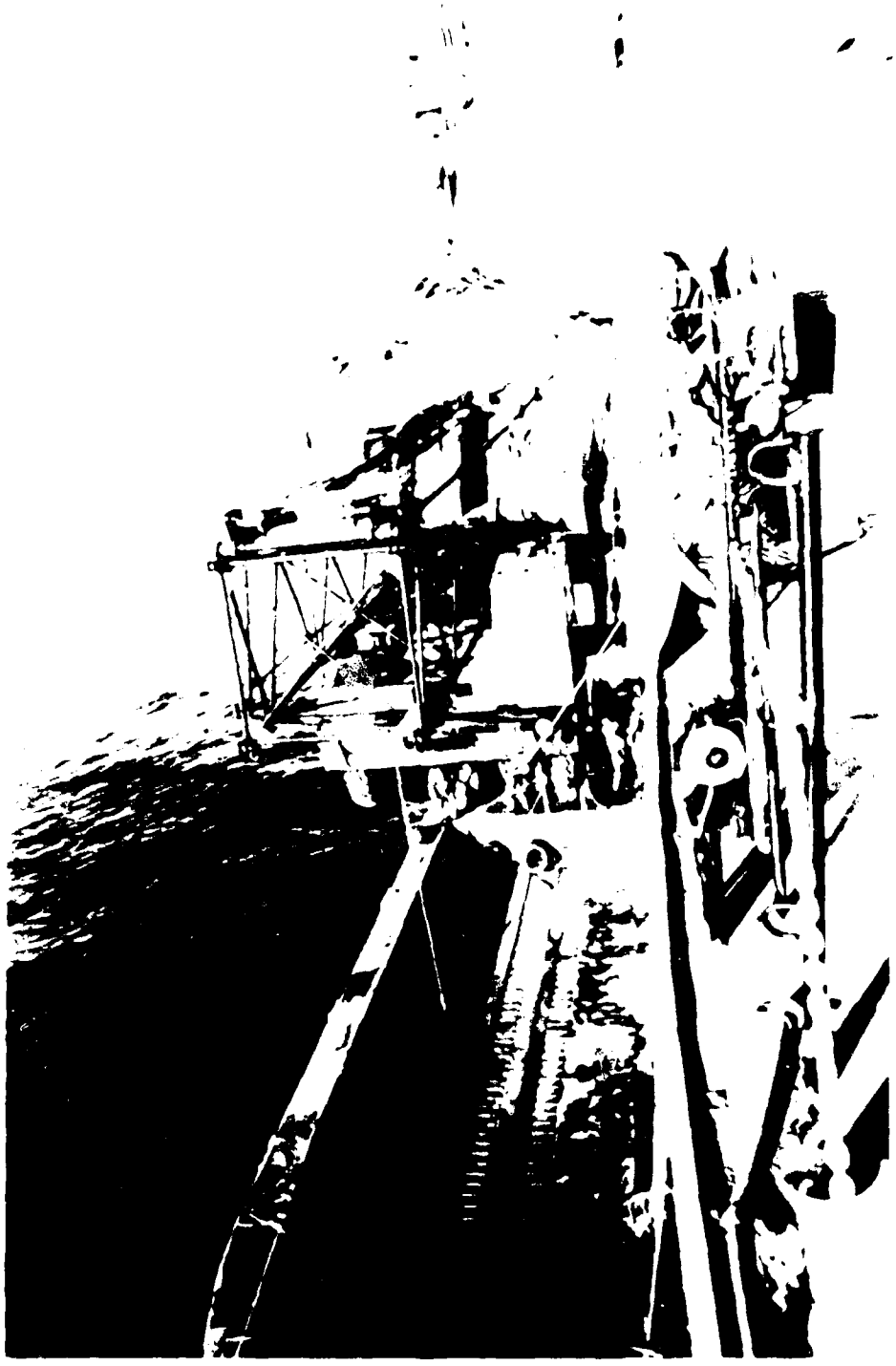
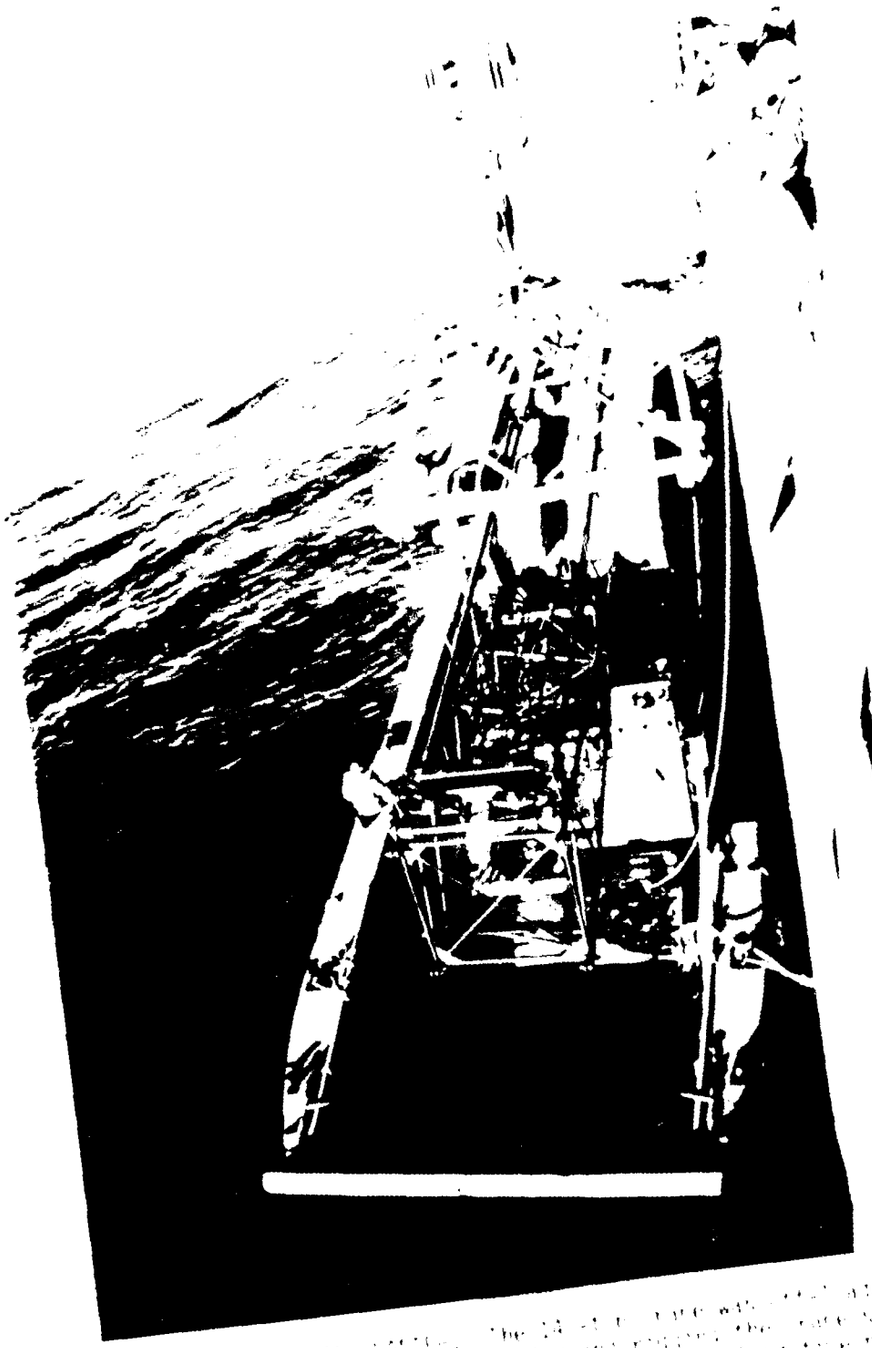
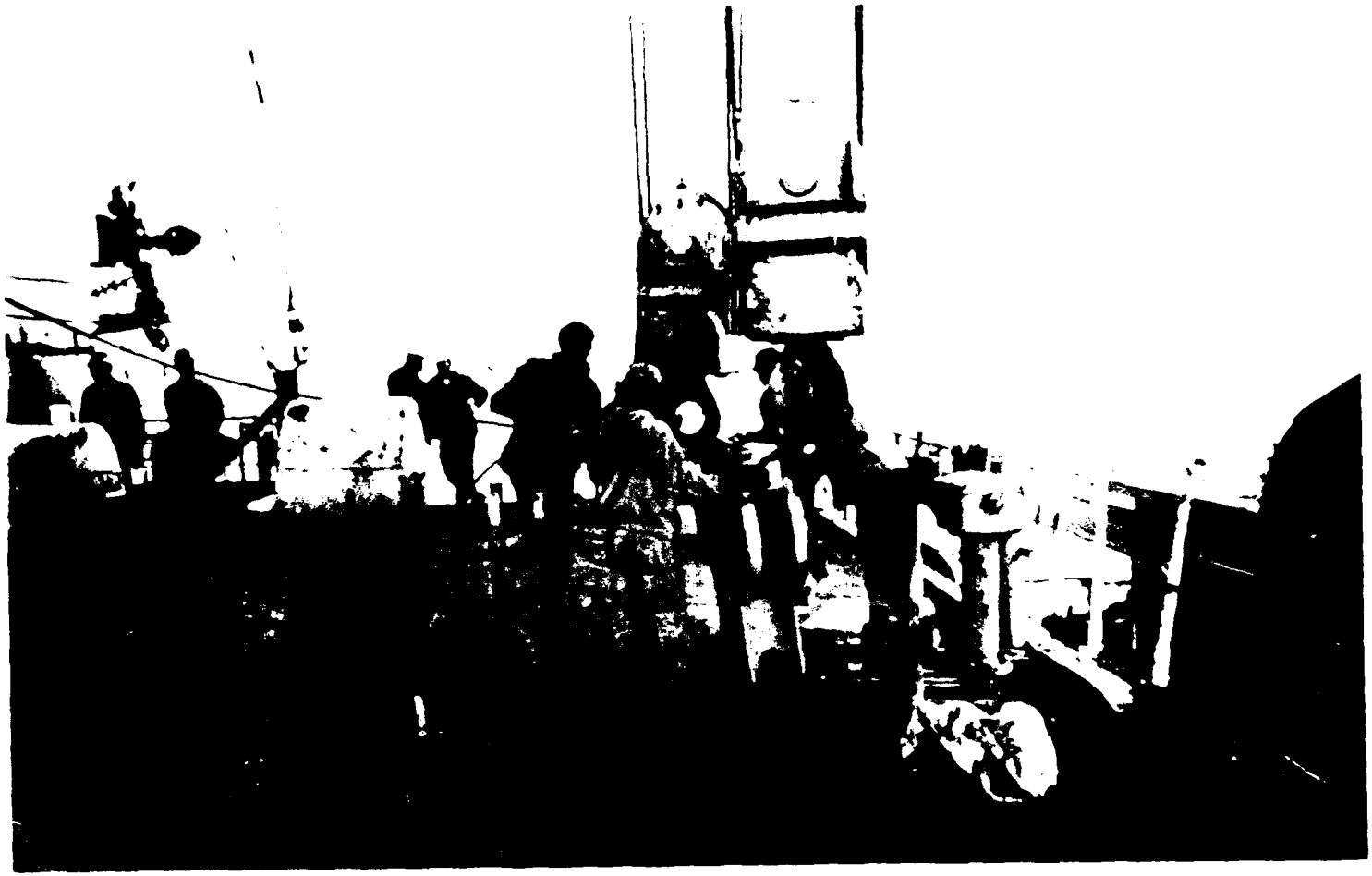


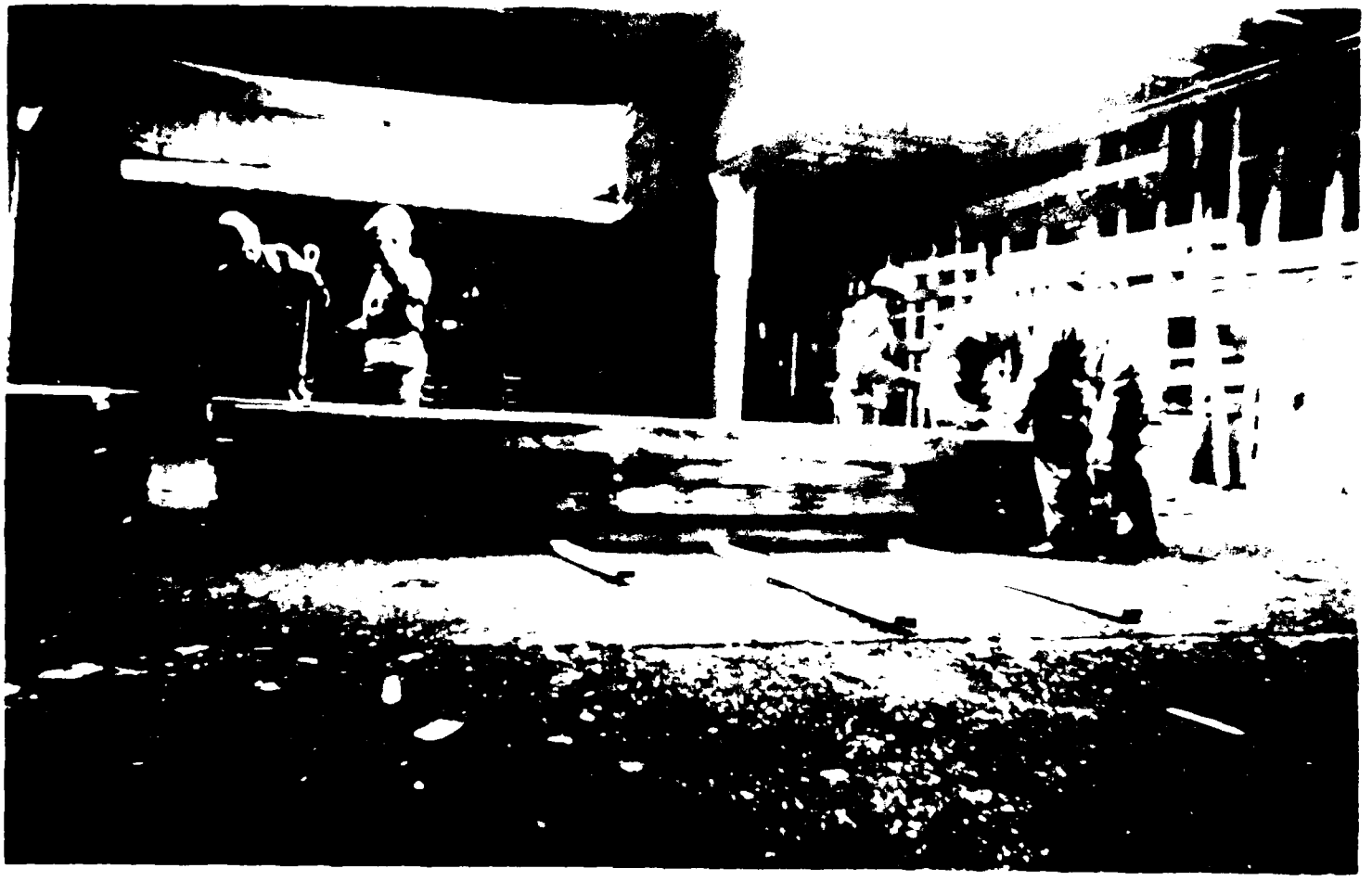
Figure [illegible]. [illegible] 1 [illegible] 1978. In lifting the 14-[illegible] pipe [illegible] the [illegible] which is 100 ft long, [illegible] than [illegible] [illegible] [illegible] [illegible].



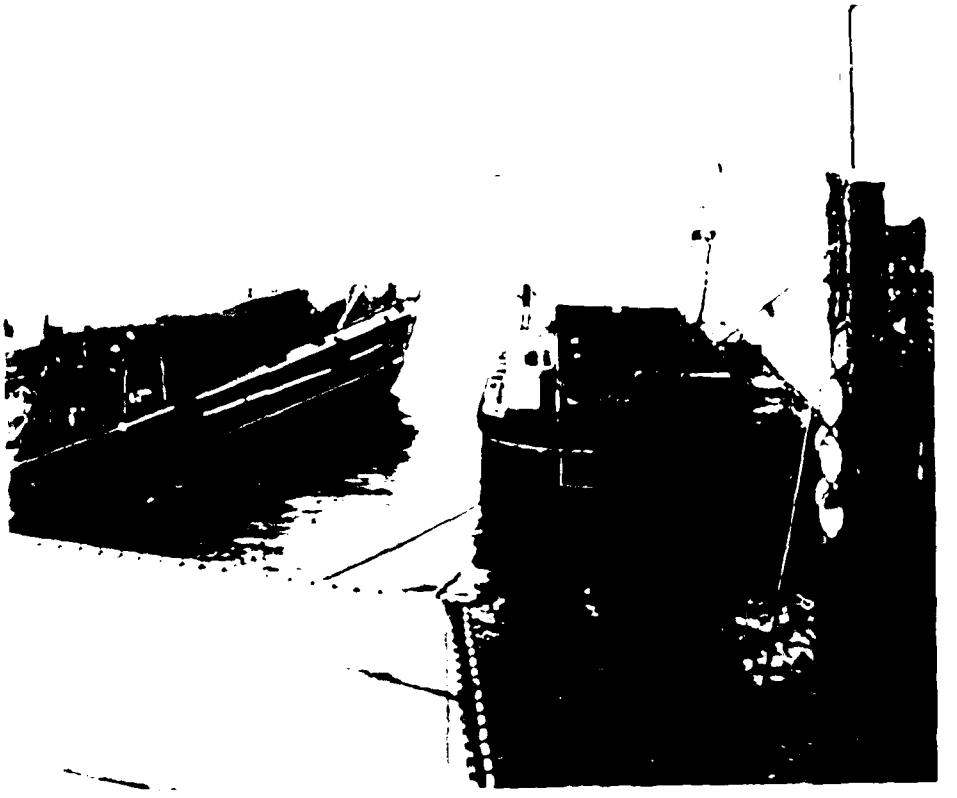
[illegible]



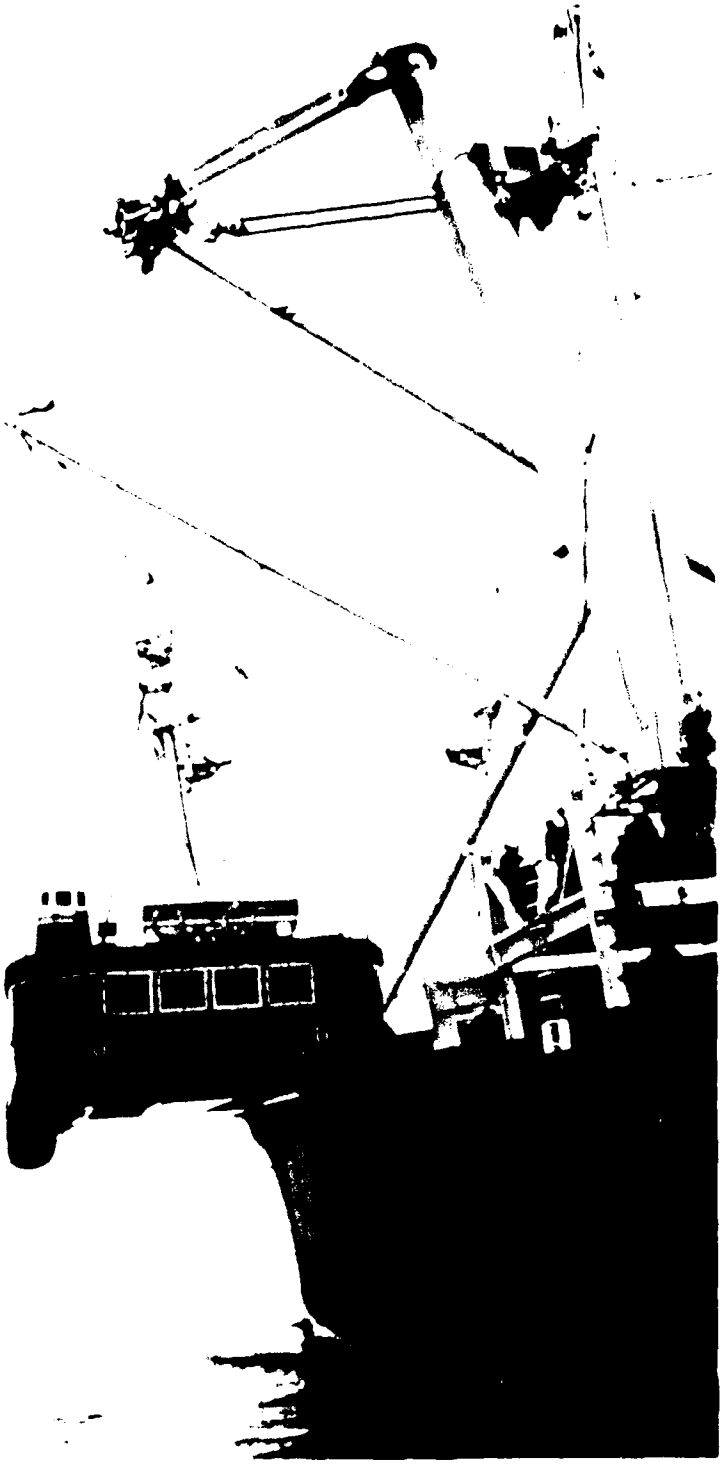




[illegible] Shed [illegible] Garage to be [illegible] [illegible]. The above view provides a perspective of the existing clearances within the [illegible]. This [illegible] has a minimum clearance of [illegible] and a clearance to the [illegible] of [illegible].



[illegible] SAWDUST BLOCK FOR LIFTING. The [illegible] which weighs [illegible] and has a height of [illegible] in be[illegible] temporarily stowed only by a heavy [illegible]



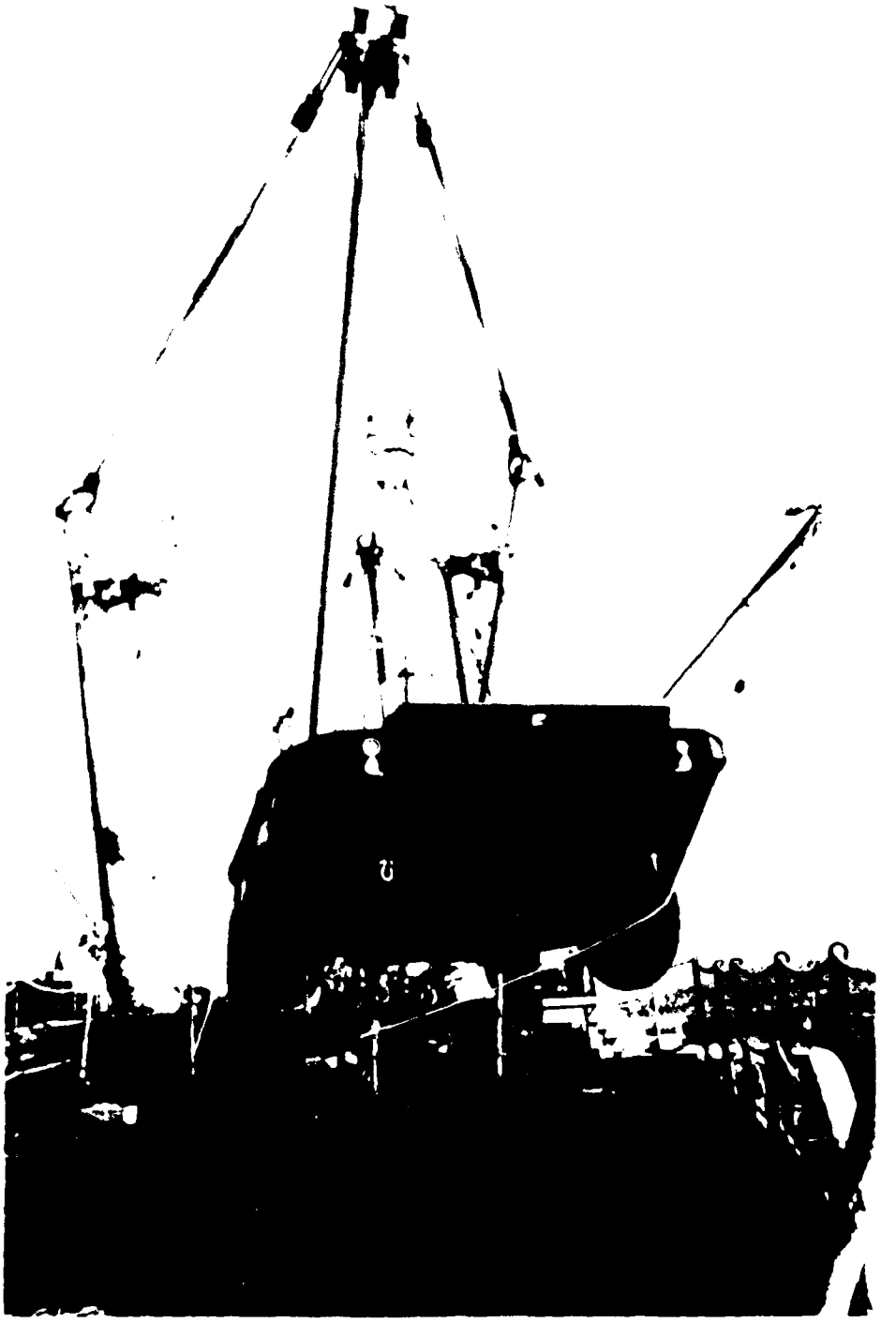


FIGURE [illegible] [illegible] PROBLEM. No overhead clearance problems were experienced by the [illegible] swinging the [illegible] high [illegible]-L[illegible] across the deck and over the rails.

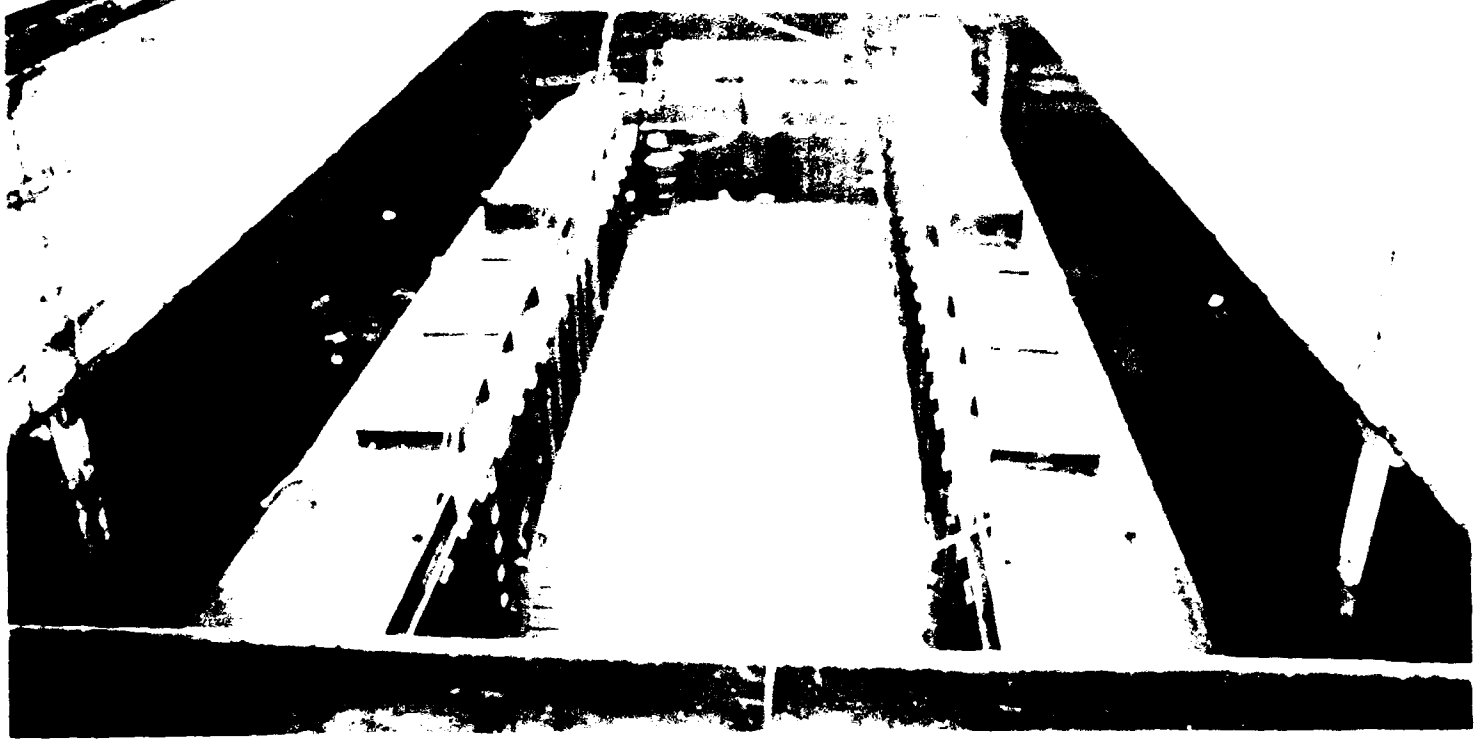
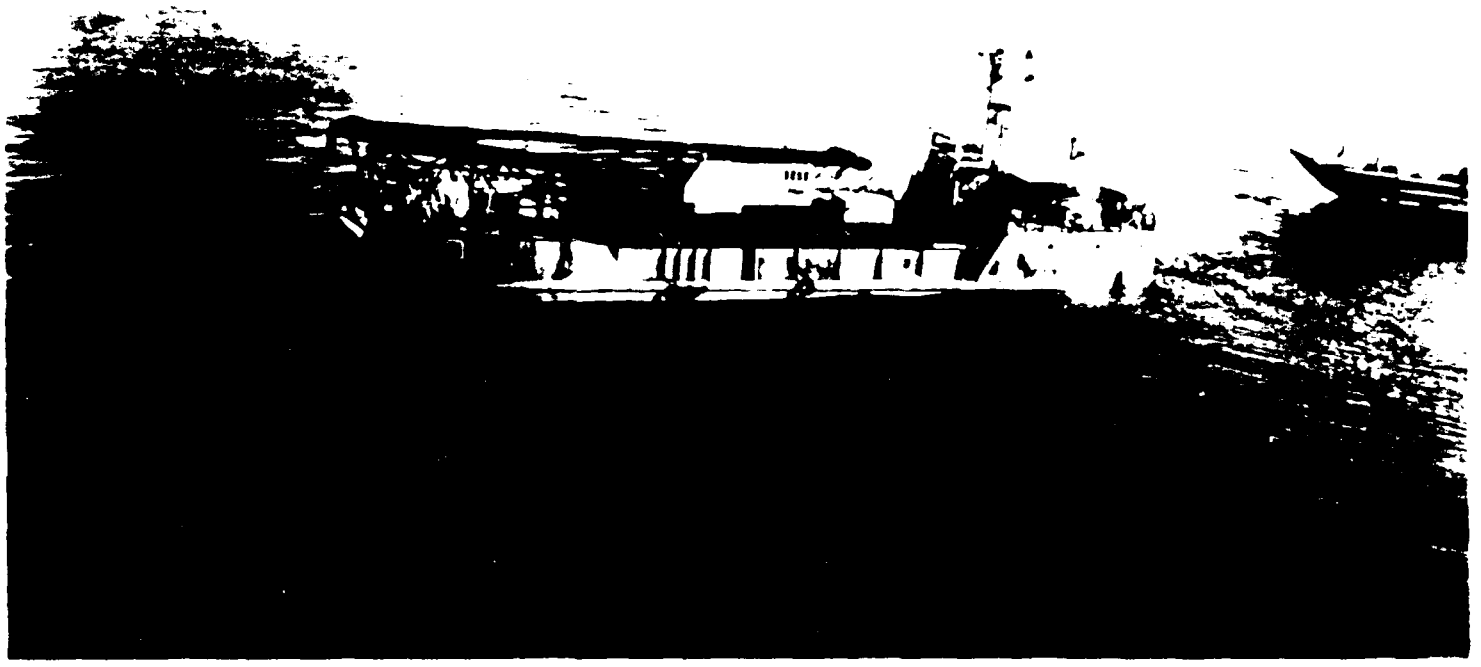
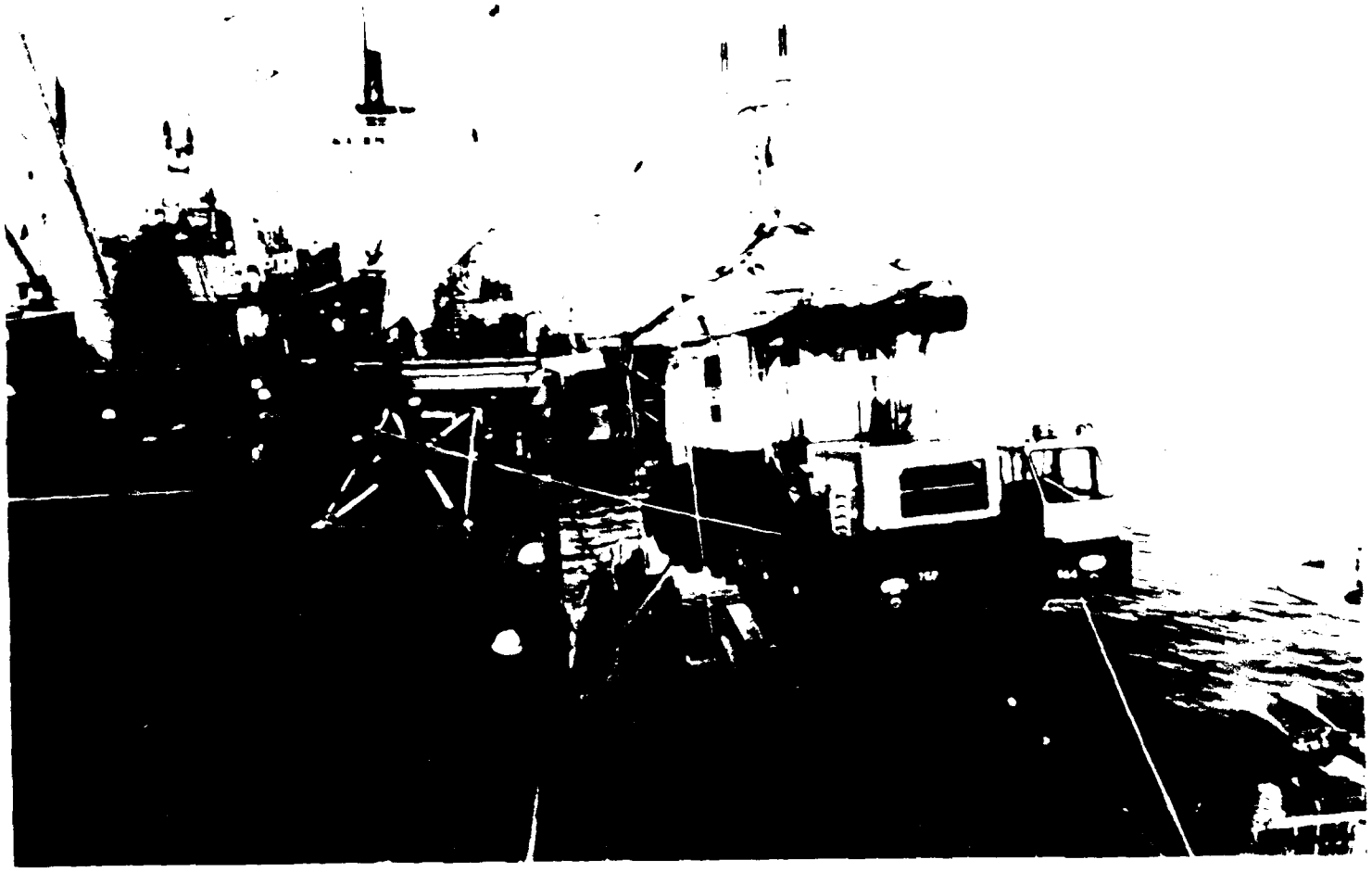


Figure [illegible] MPC[illegible] [illegible] one-third of the 36-min [illegible] the amphibi[illegible]





AD-A149 368 HEAVY-LIFT BREAKBULK SHIP PRETEST RESULTS OF THE JOINT LOGISTICS-OVER-THE..(U) ORI INC ROCKVILLE MD H CASEY ET AL. 25 JUL 77 ORI-TR-1168 MDA903-75-C-0016 2/2

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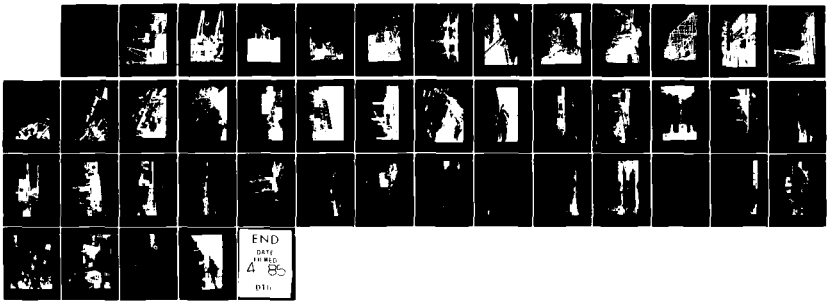


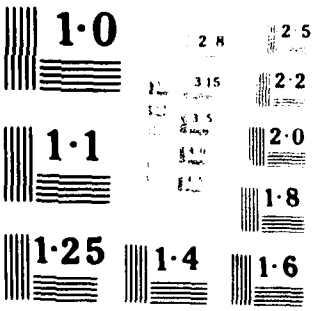

1·0
2·8
2·5
3·15
2·2
3·5
1·1
2·0
1·8
1·25
1·4
1·6

FIGURE D.29. SIDELOADER EASY LIFT. Compared to the other equipment embarked the sideloader went aboard relatively easily. It weighs 64 long tons and is 41 ft long, 12.5 ft wide, and 11.7 ft high.

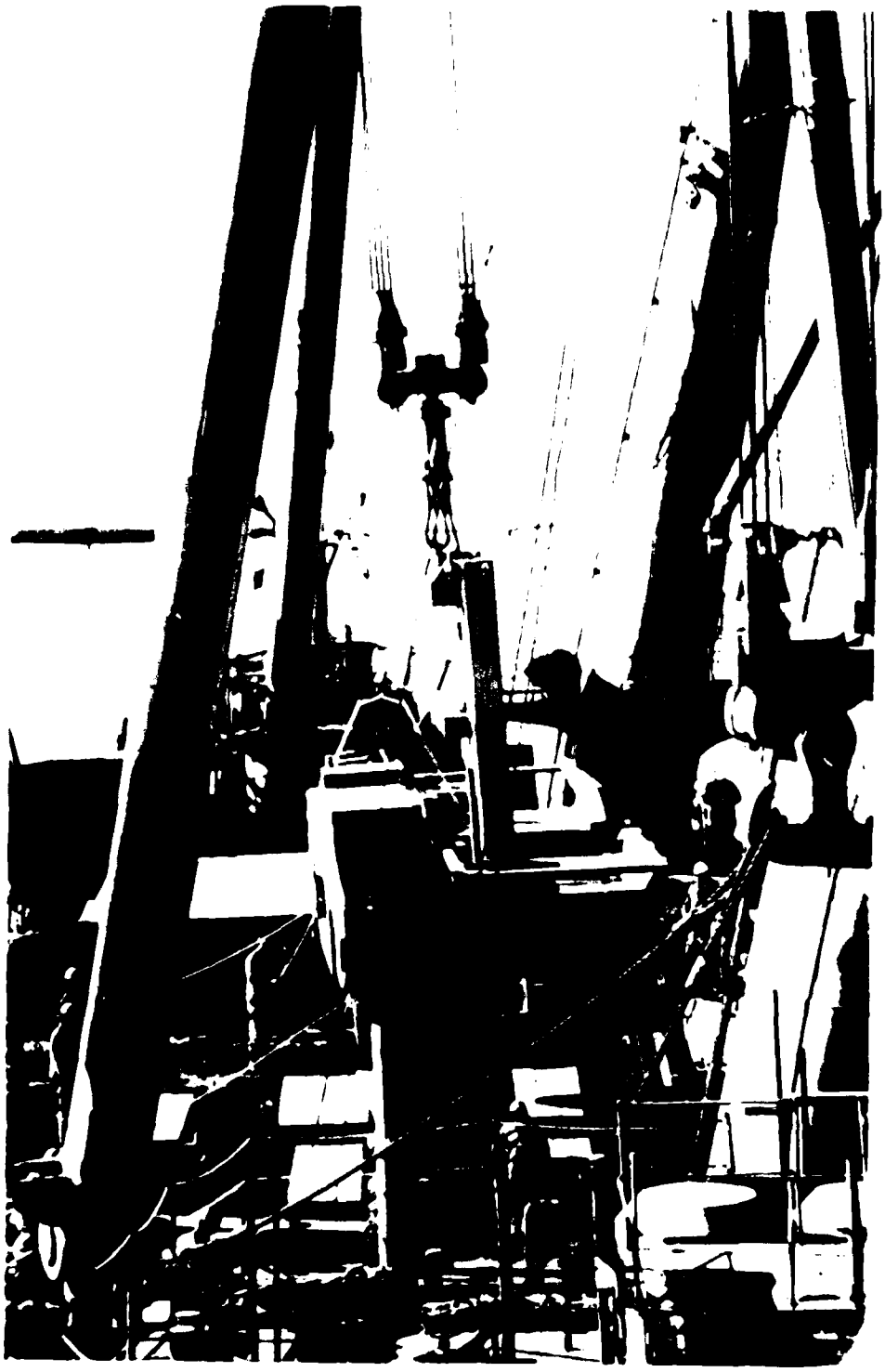


FIGURE D.30. SIDELOADER DECK-STOWED. The sideloader could have been stowed in a hold but to reduce loading time so that other events could be accomplished, it was deck-stowed. Its loading time was only 27 minutes, including rigging time.

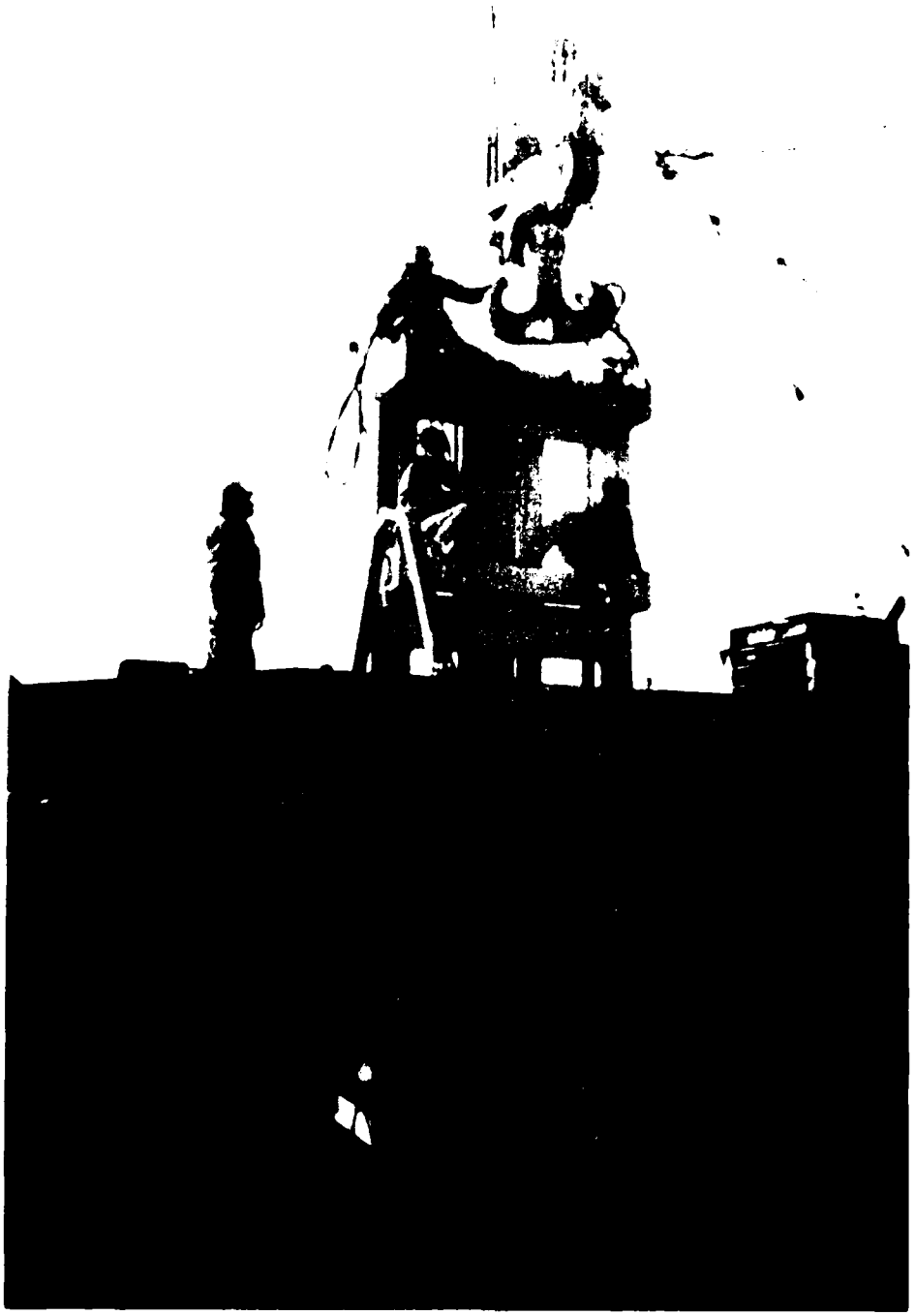


FIGURE [illegible] [illegible] the skidder for lifting it is necessary to [illegible] attach and detach the chokers on the hook required [illegible] lifting cycle and 9 minutes during off-loading.

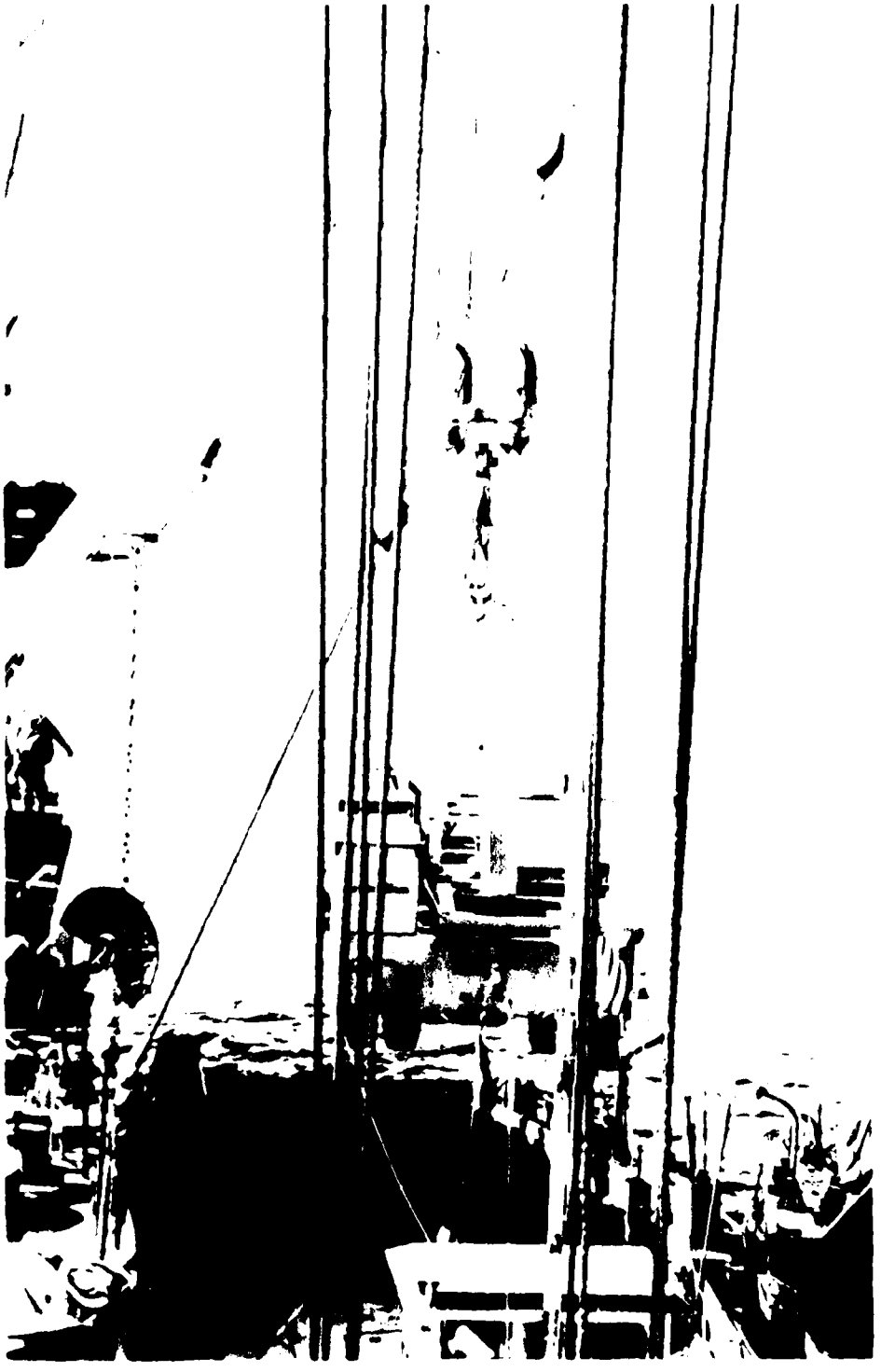


FIGURE D.32. SIDELOADER PLACED IN CLU. No difficulties were experienced off-loading the sideloader into an LCU. The sea state was relatively calm and the wind was light.

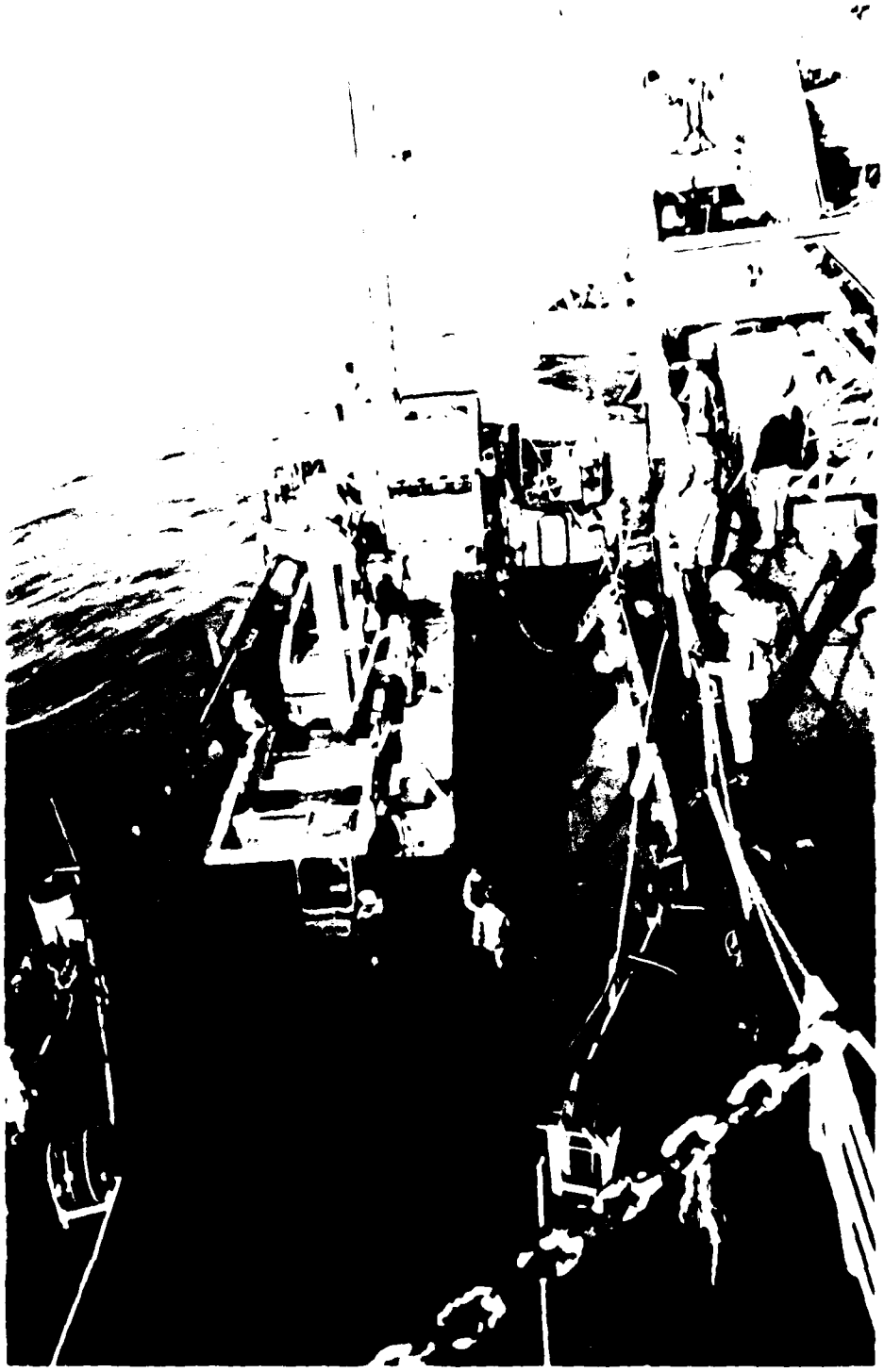


FIGURE [illegible]. OFF-LOADING TIME 34 MINUTES. The sideloader lift was the fastest one made. It took 34 minutes to off-load the sideloader, including time to moor and cast off the LCU.

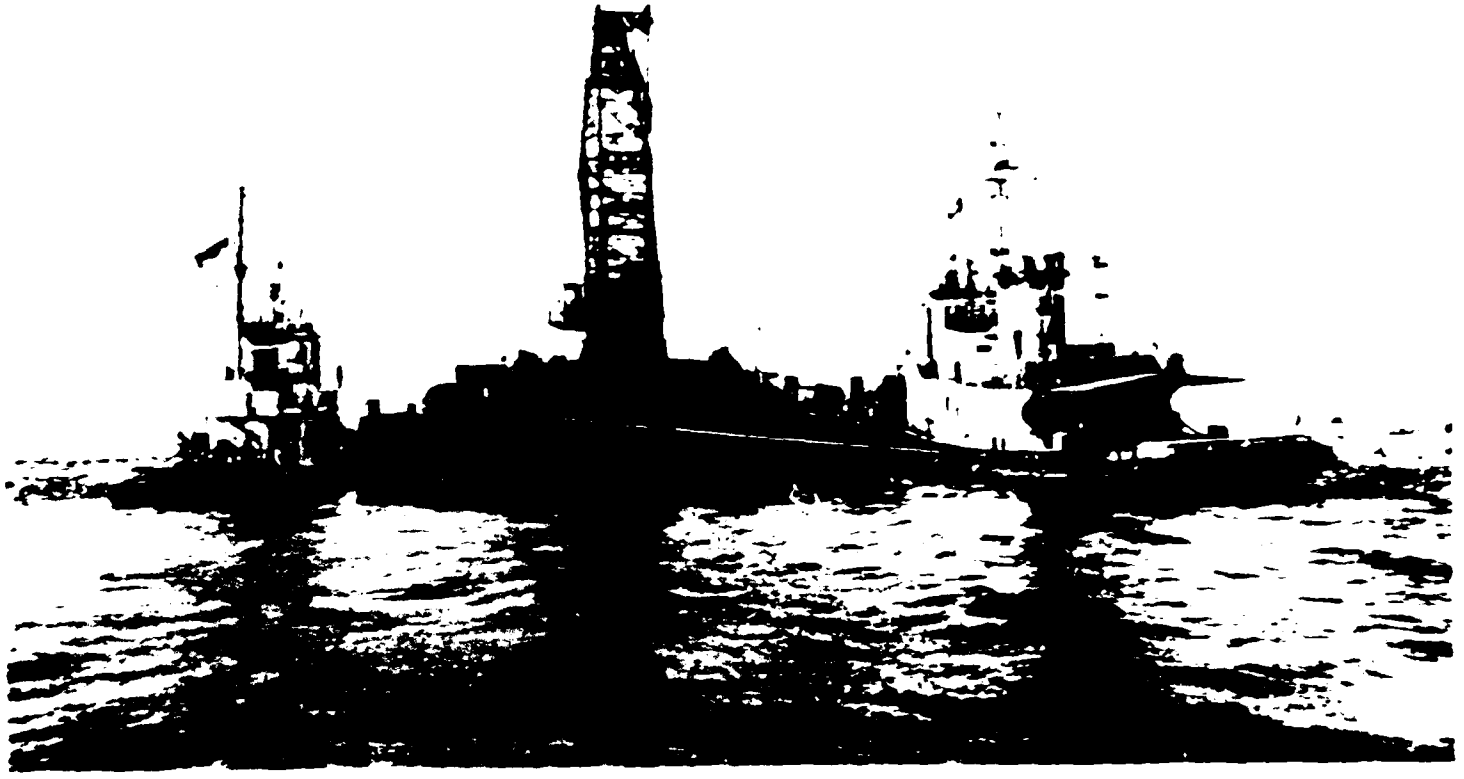


FIGURE D.34. TCDF TOWED TO PRETEST SITE. Once the deployment cargo had been off-loaded, the TCDF was positioned alongside the ship so that containers could be off-loaded and throughput events could begin.

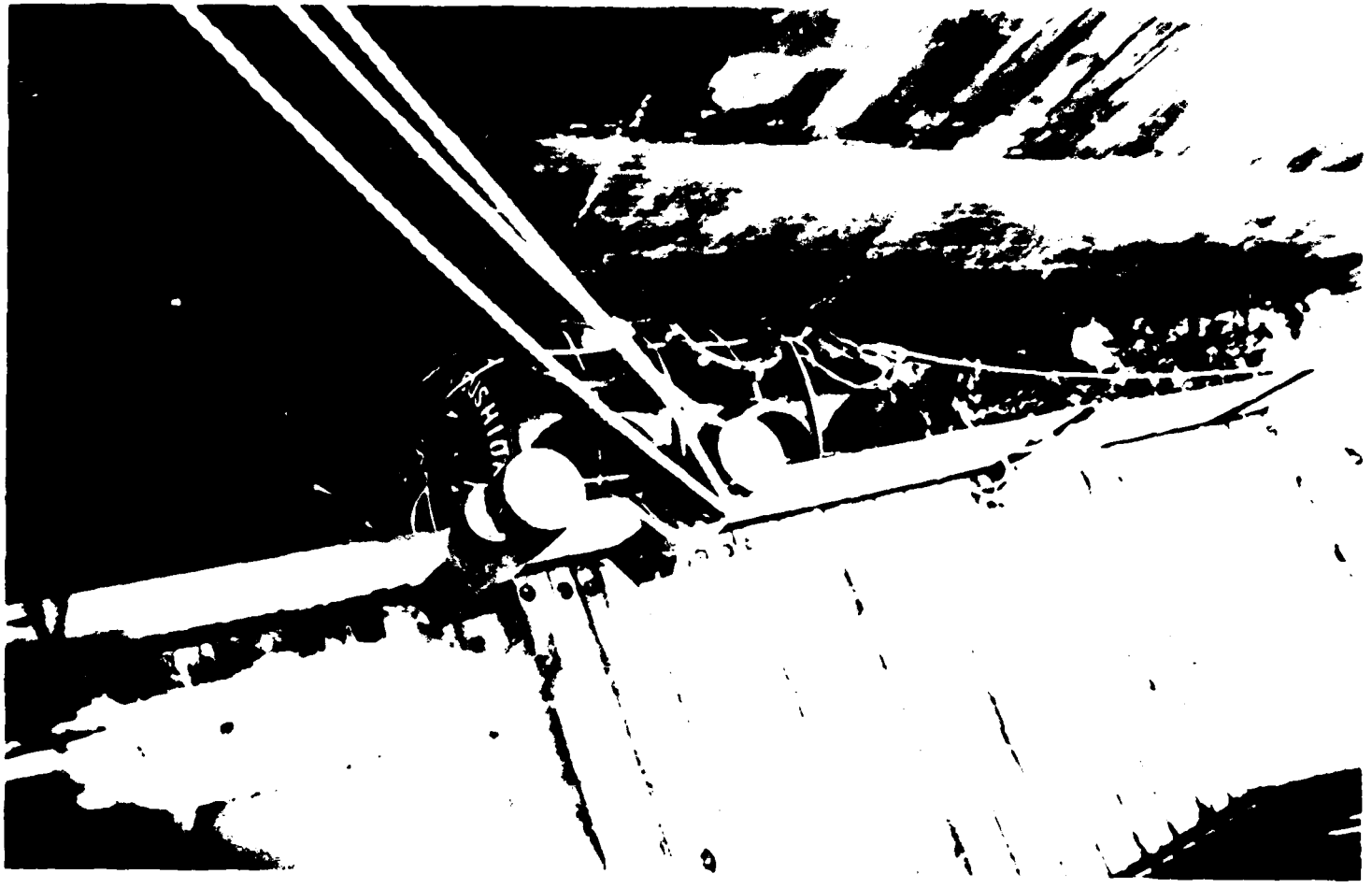


FIGURE D.35. FENDERS USED. Two special inflated fenders, one of which is shown above, were used to separate the TCDF from the ship.

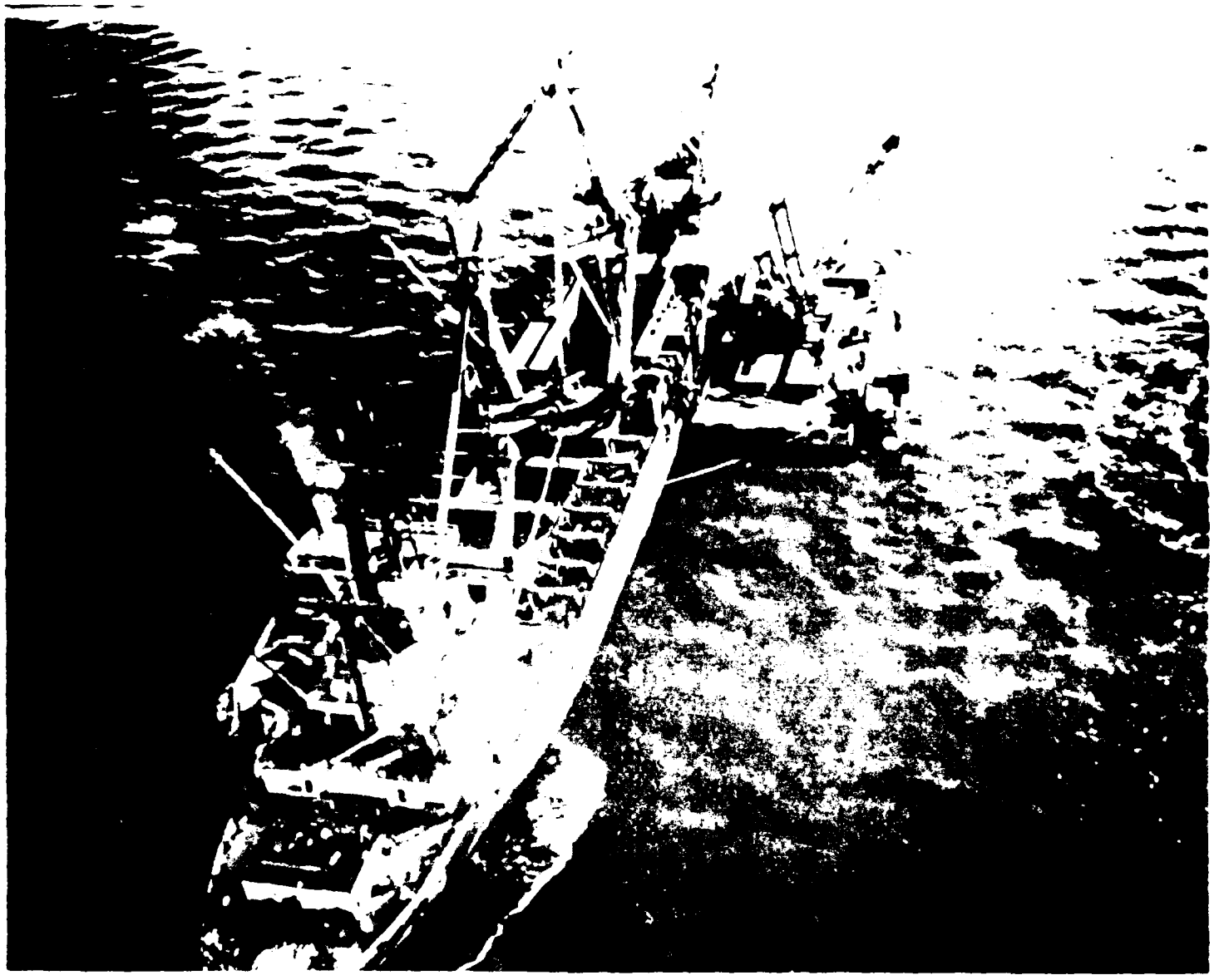


FIGURE 5.56. OPERATION AT THE BOW. After the initial load of containers had been discharged the TCCF was moved to the bow of the ship. Later, when the TCCF had swung into the gap at the bow shown in the photo above, the container spreader bar had to be turned further to line up with the containers. This was difficult because a two-point attachment was used between the crane and the spreader bar.

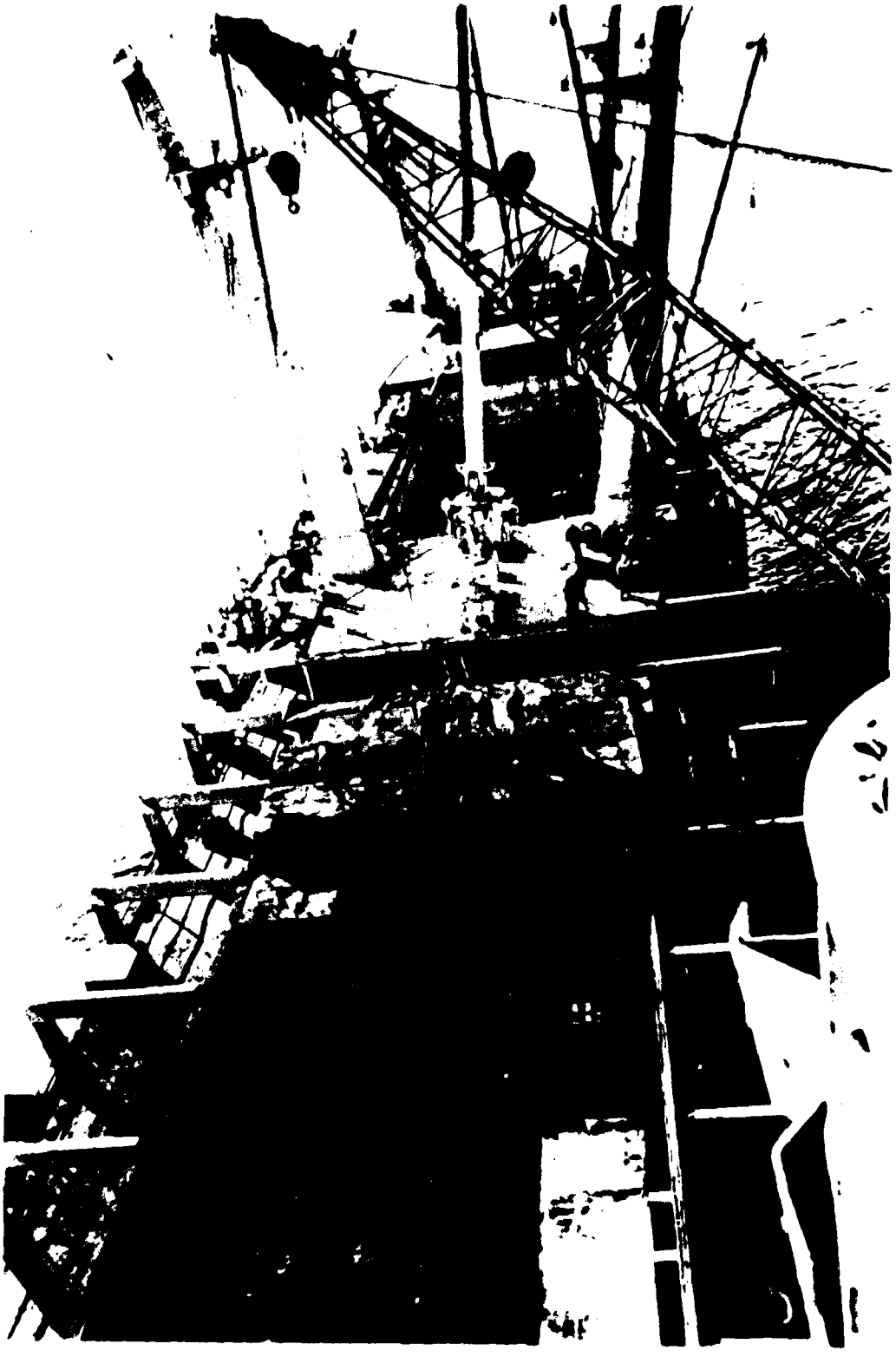


FIGURE D.37. TCDF OPENS HATCH. To gain experience and crane data on hatch square opening, the TCDF was used to remove the 5-ton sections of the hatch cover.

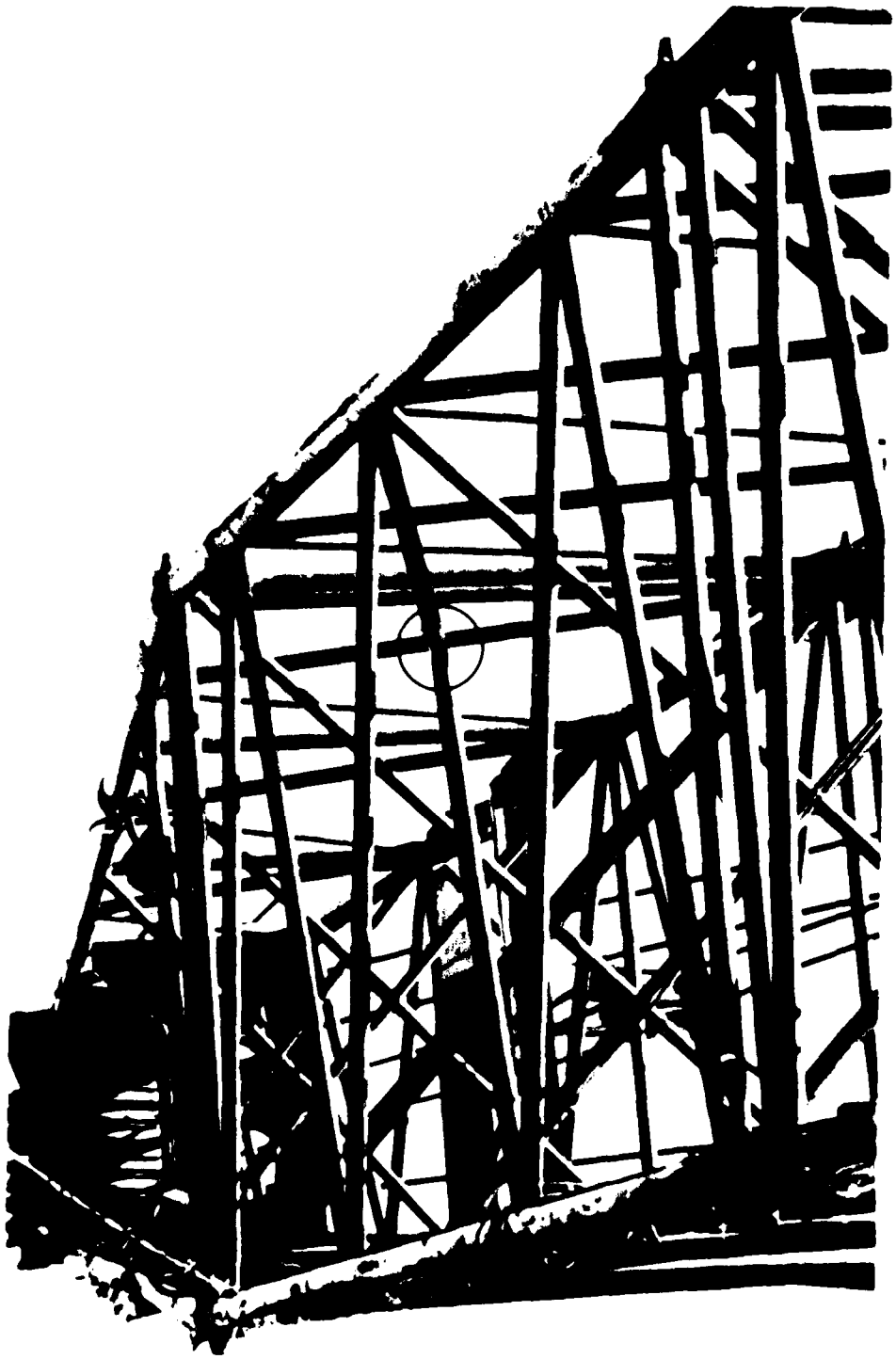


FIGURE D.38. BLOCK DENTS CRANE BOOM. On the first full day of container unloading the sea state caused the crane's block to pendulate during a break in the unloading. The heavy block struck the boom's tubing with sufficient force to seriously dent it.

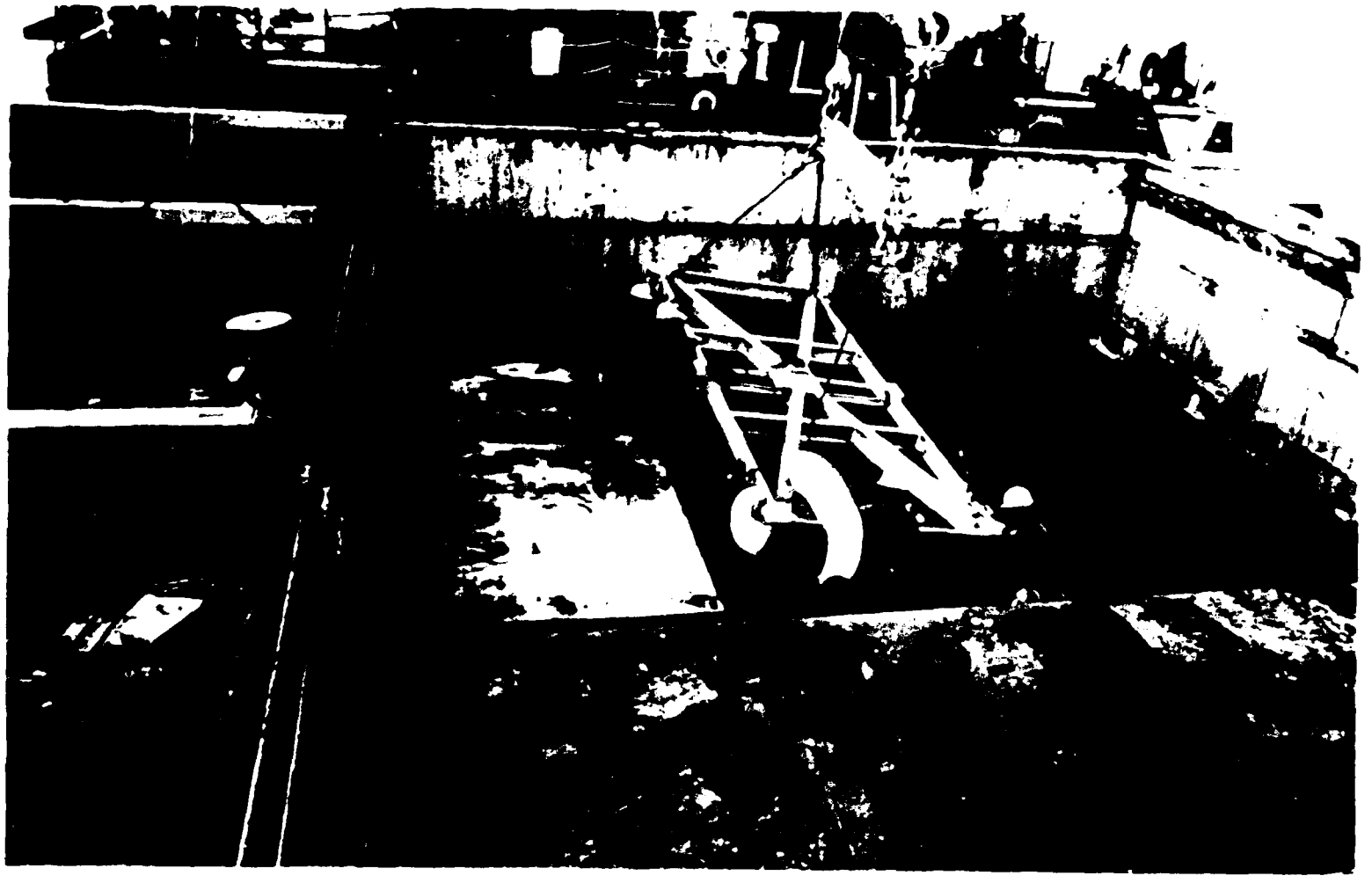


FIGURE D.39. POSITIONING SPREADER BAR. Without cell guides it was necessary to position the spreader bar manually in the hold. If the boom was not at a 90-degree angle to the container axis, delays and difficulties in attaching the spreader bar were experienced.

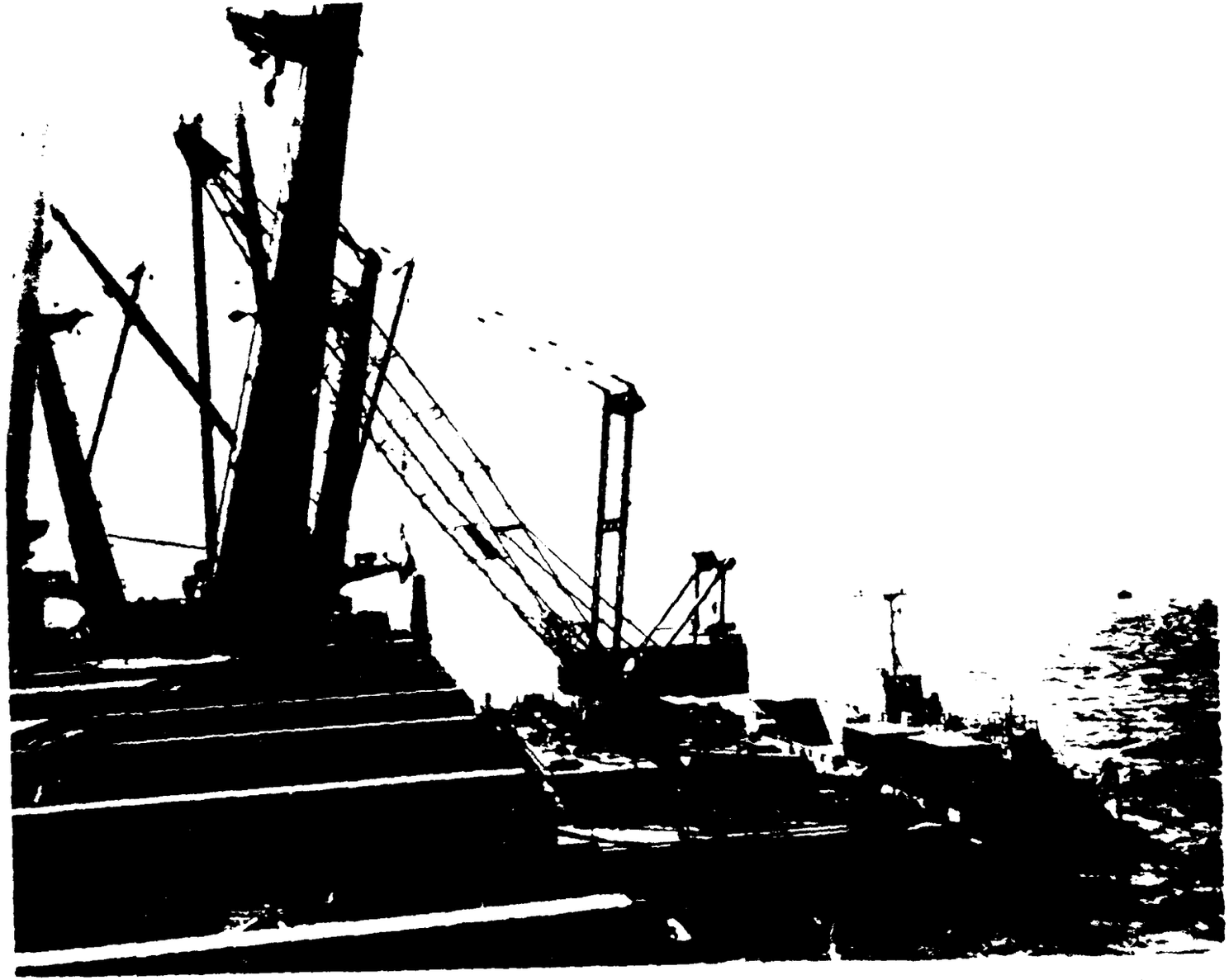


FIGURE D.46. BOOM TOPS F. Once the container was attached the crane had to top up as well as raise the hook in order to clear the ship's booms and kingposts. This added delays to cycle times that would not be typical of operations on the clear deck of a containership.

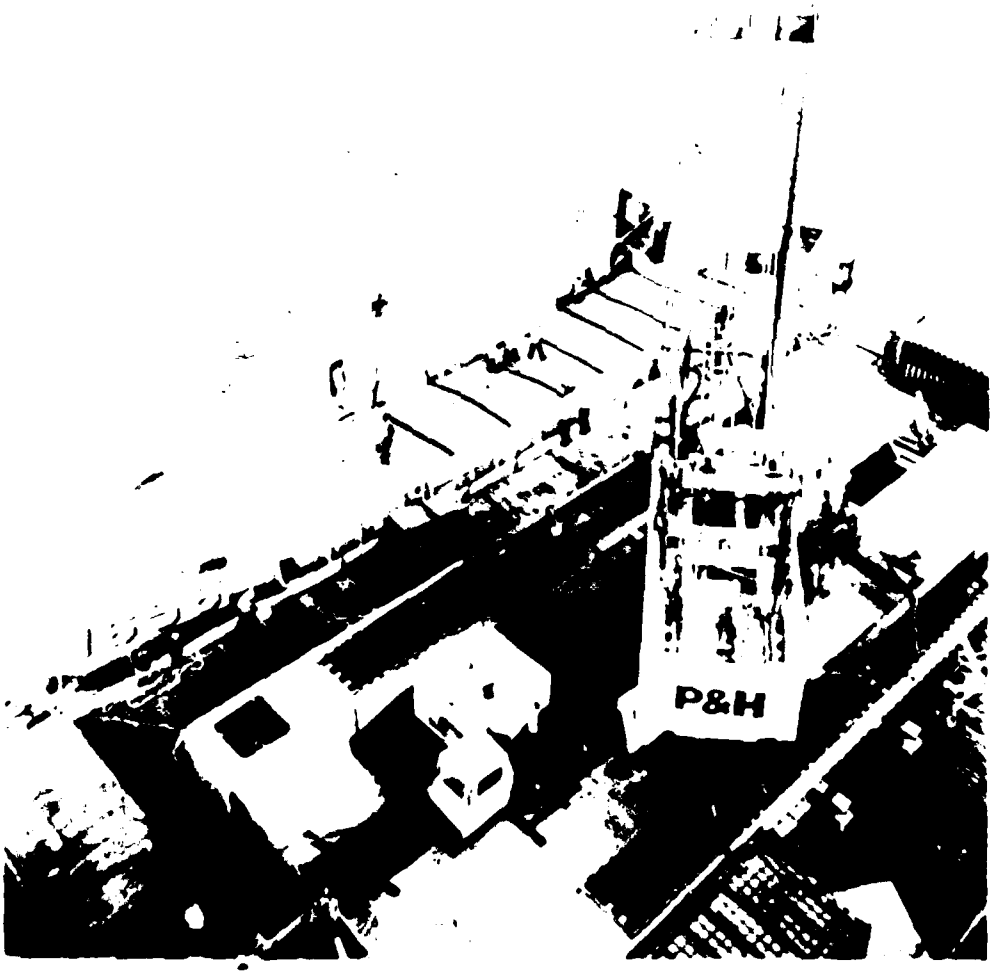


FIGURE D.41. LCU USED FIRE HOSE. To cushion the impact of containers being lowered, a problem when there is a sea state, fire hose was used on the deck of this LCU.

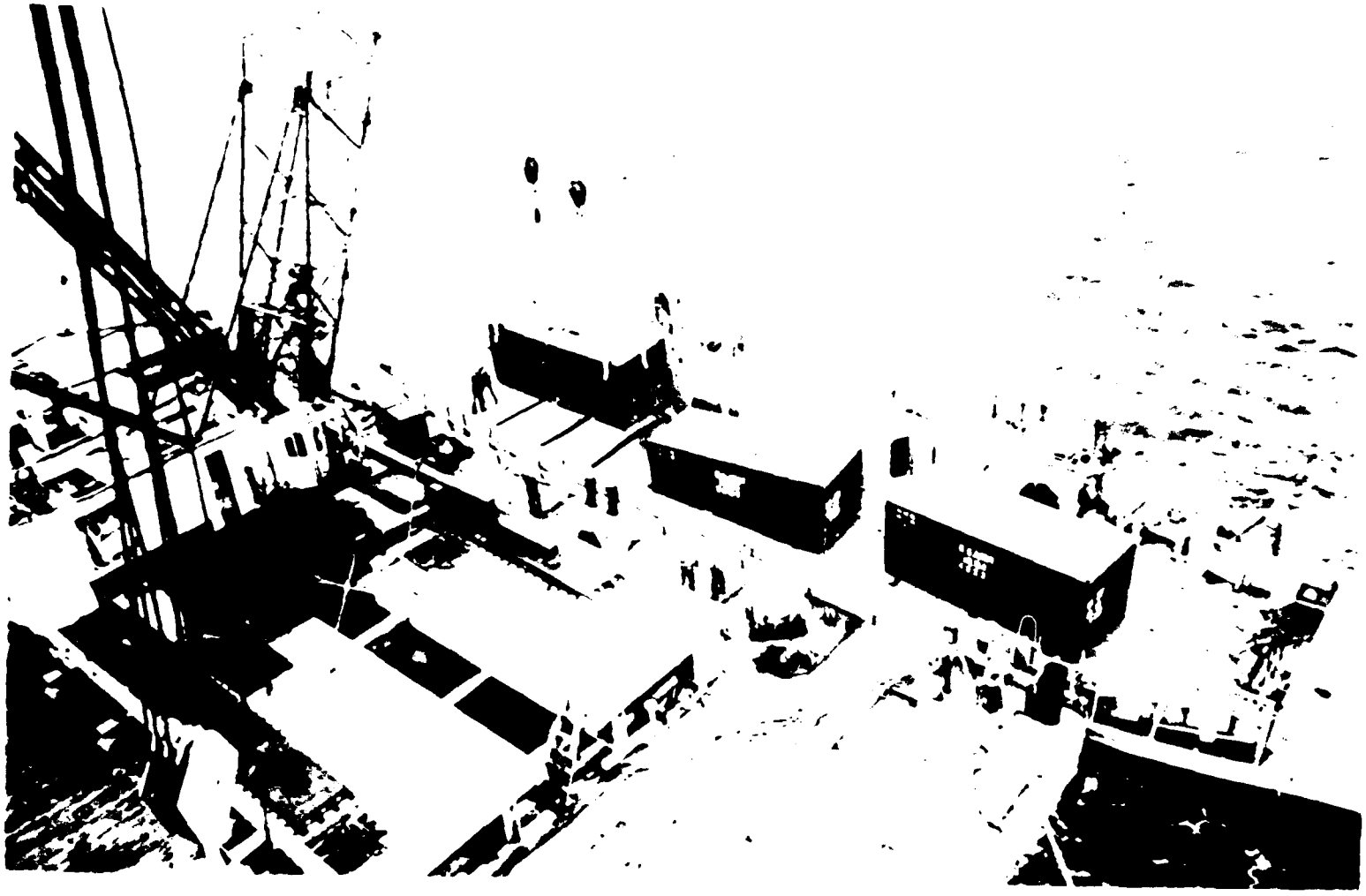


FIGURE D.42. LCU LIGHTLY LOADED. Normally an LCU would be loaded with four containers but because of the limited number of containers available, capacity loading was not practiced.

FIGURE D.43. MOBILE LOADING TIME-CONSUMING. One method of minimizing handling at the beach is to place trailers on a causeway ferry and load the trailers shipside. However, because of the motion of the seas and the need for close alignment during loading, it required approximately an hour to load just two of three trailers and it became apparent that the method was too time consuming.

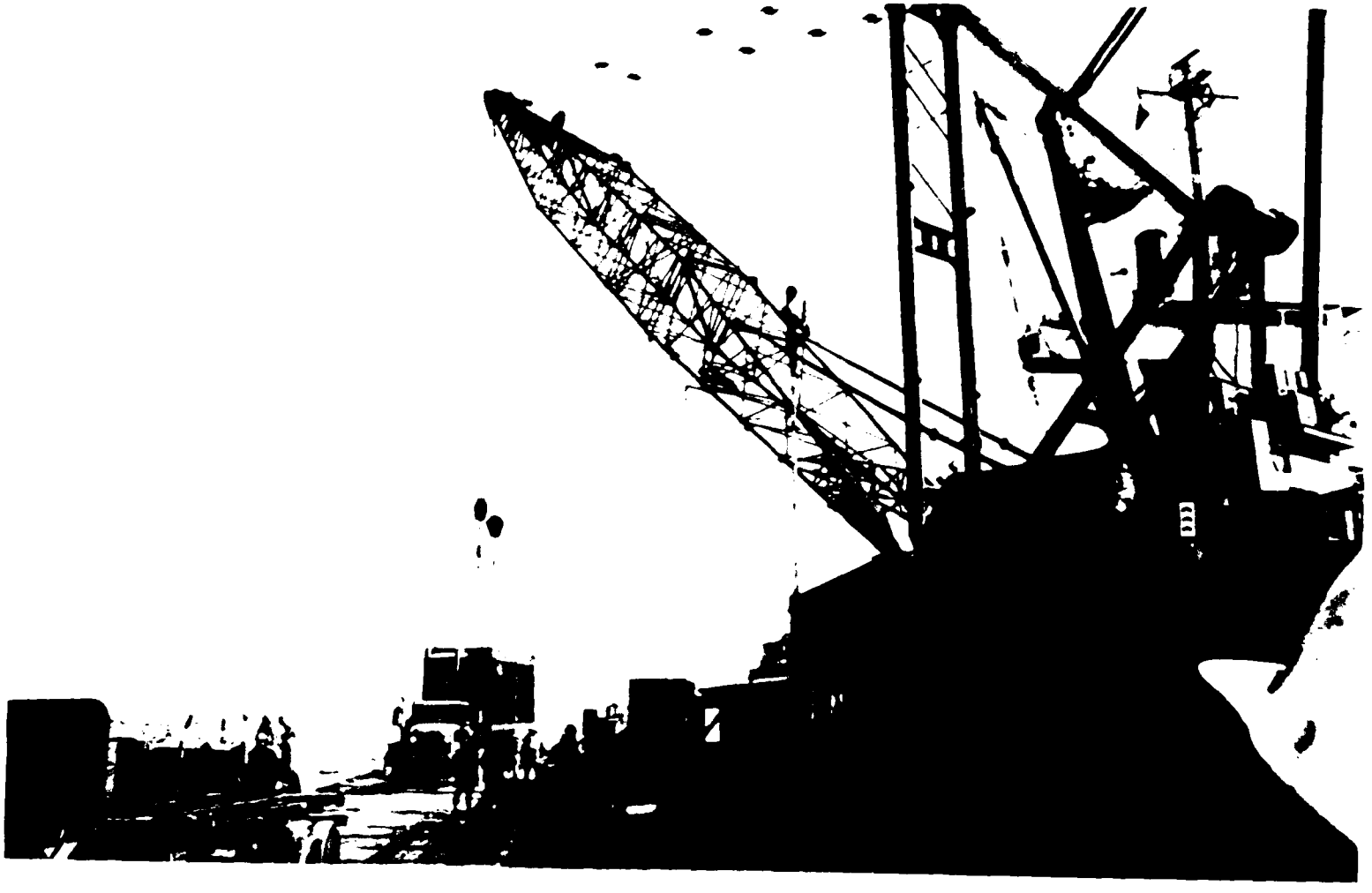


FIGURE D.44. SPREADER BAR NOT ALIGNED. With a two-point spreader bar attachment and automatic taglines, the spreader bar and container were nearly always perpendicular to the boom, while the trailer chassis was not. This necessitated man-handling the container until it was in a position that would permit lowering the trailer corner fittings.

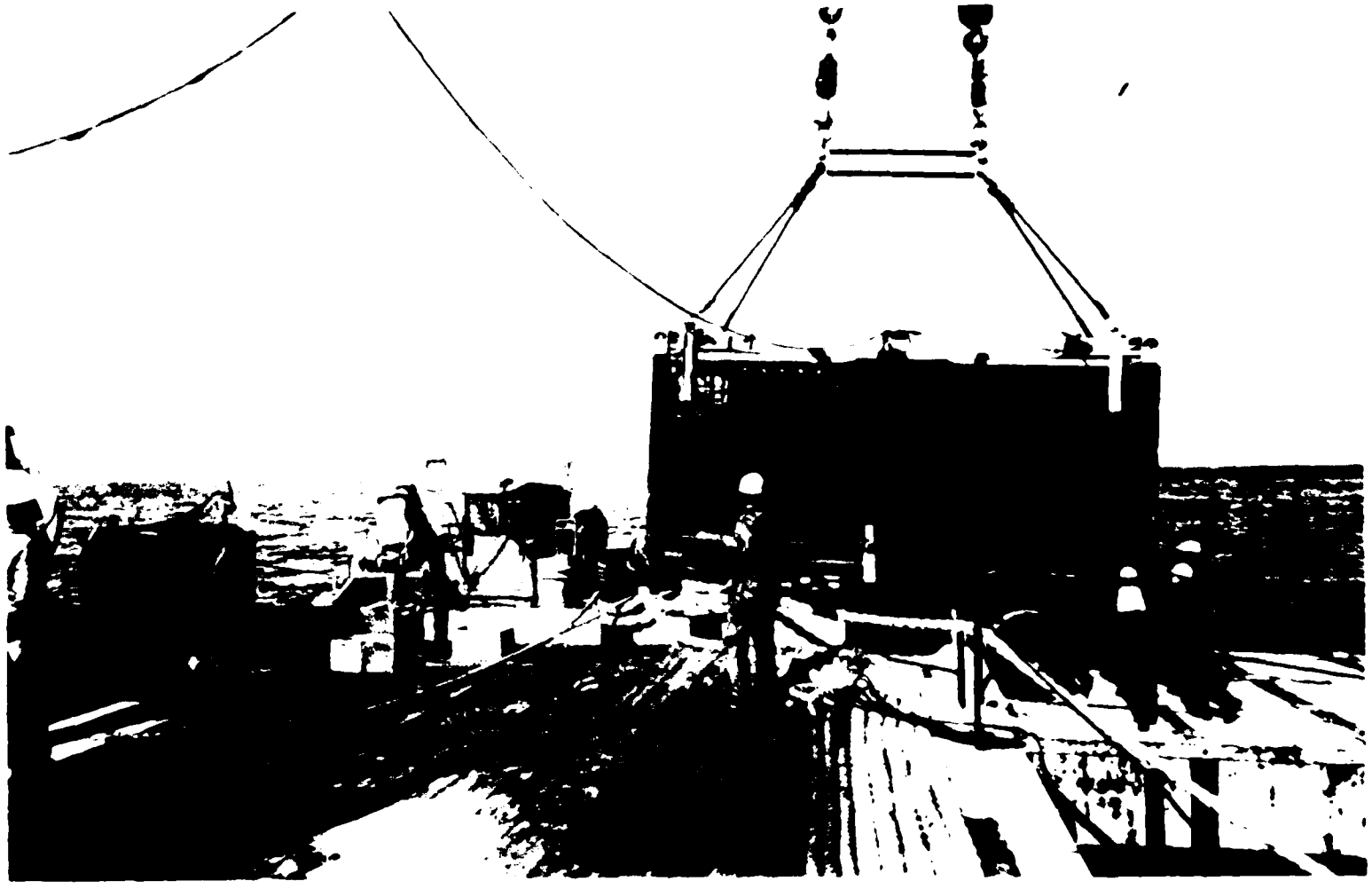


FIGURE D.45. ALIGNMENT DIFFICULT. Aligning the container with the trailer required from 4-6 personnel to force the container into position so it would engage the corner fittings. Because the procedure was so time-consuming one trailer returned to the beach without being loaded.

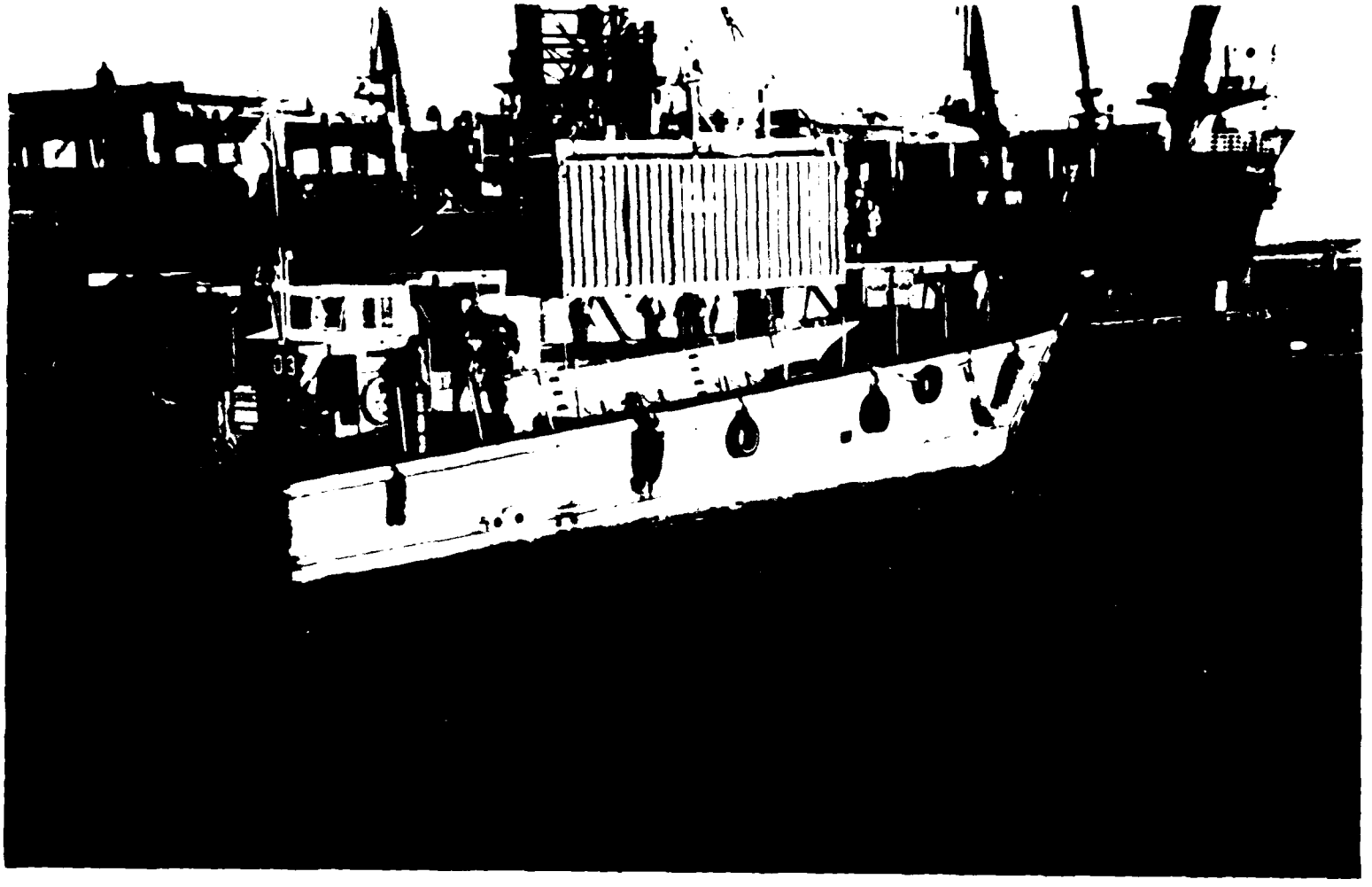


FIGURE D.46. LCM8s USED. LCM8 landing craft received extensive use in the pretest and had better beaching capabilities than LCUs, although both were unable to beach close enough to shore cranes at low tide.

FIGURE D.47. DELONG PIER POSITIONED. To improve shoreside unloading capabilities a 140-ton crane was positioned on a DeLong barge and towed to the objective area. The DeLong was beached using two LCMés. Later the DeLong was jacked-up out of the water on its pilings and ramps were added so that trucks could drive from the beach onto the pier.

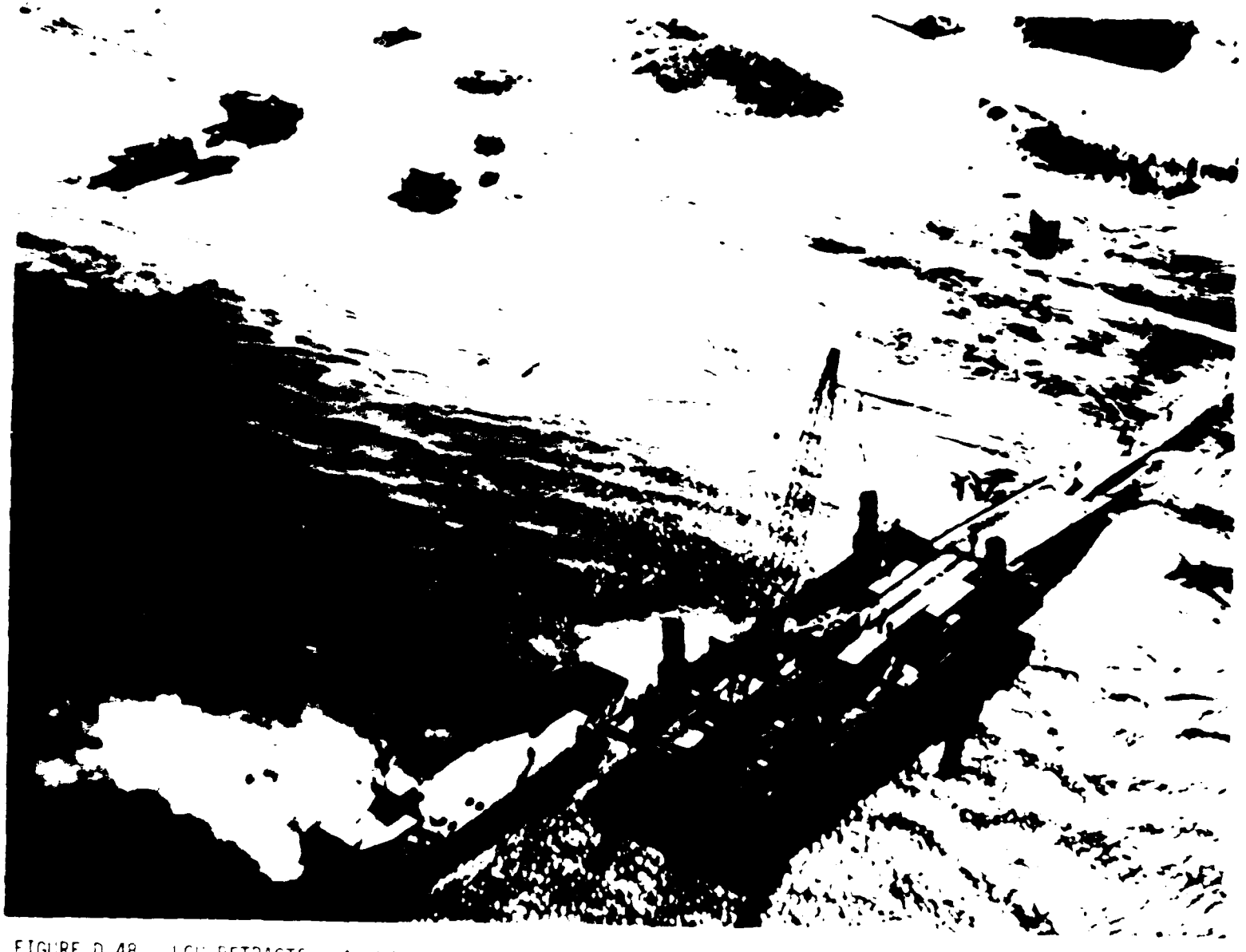


FIGURE D.48. LCU RETRACTS. An LCU is shown above retracting from the DeLong pier after unloading at high tide.

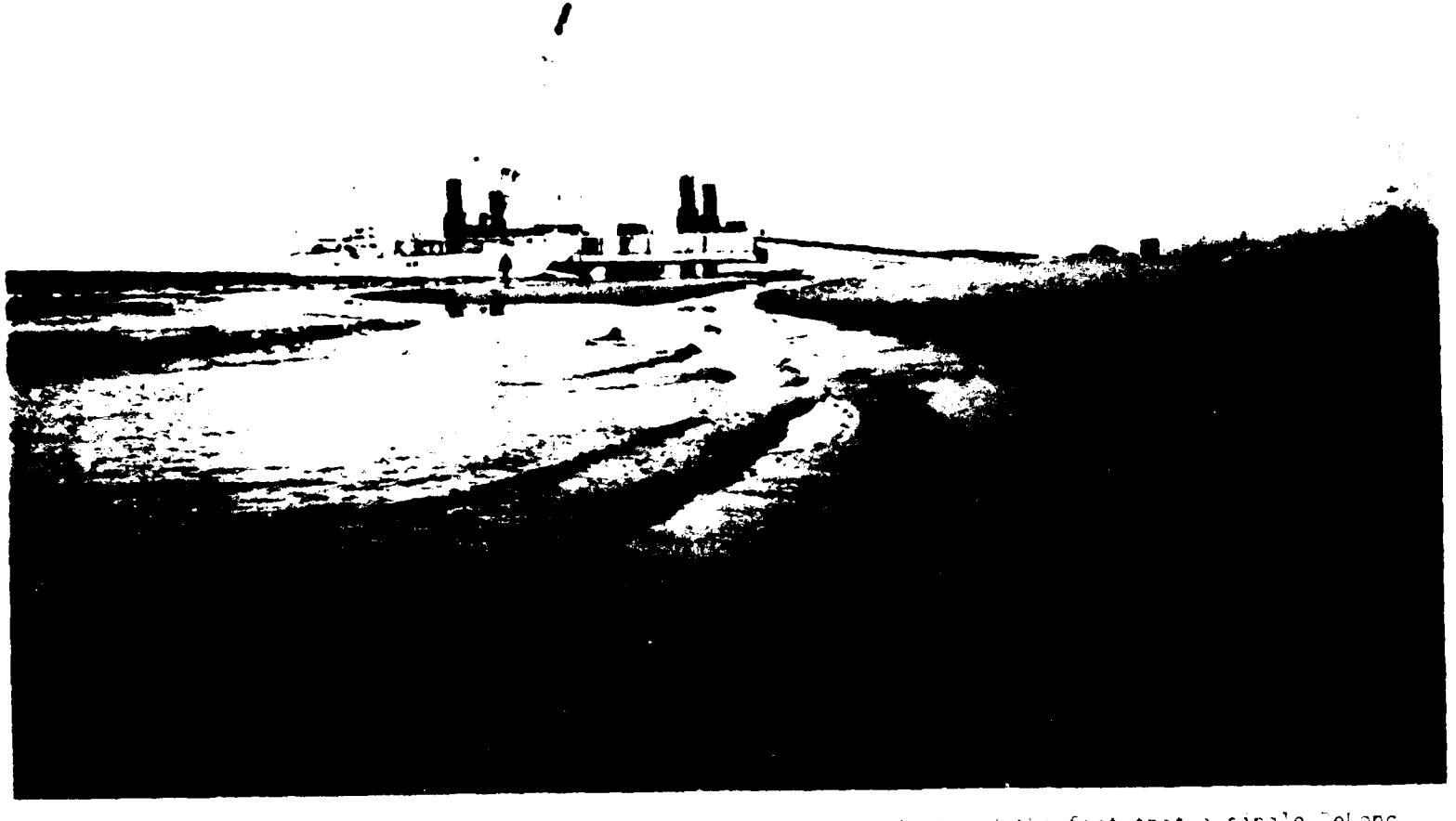


FIGURE 2.49. LOW TIDE PROBLEMS. Because of the gentle beach gradient and the fact that a single DeLong does not extend far enough seaward, landing craft were stranded at low tide. At low tide only amphibians could be unloaded.

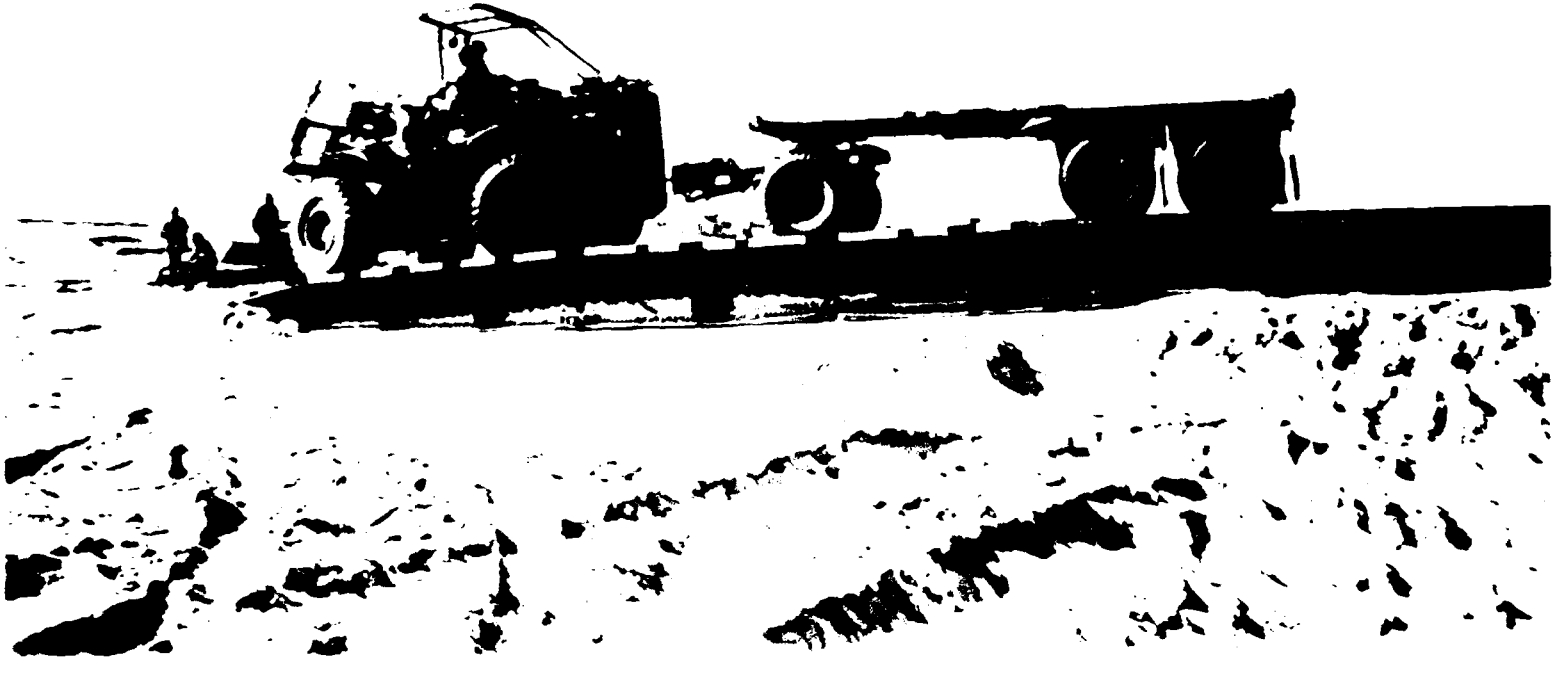


FIGURE 2.50. RAMP PROBLEMS. Truck drivers experienced difficulty backing their trailers up the ramp so a rough terrain forklift, which has articulated steering, was tried. The above ALB ramp connects onto the DeLong ramps. The ALB ramp was subsequently replaced by a sand ramp.

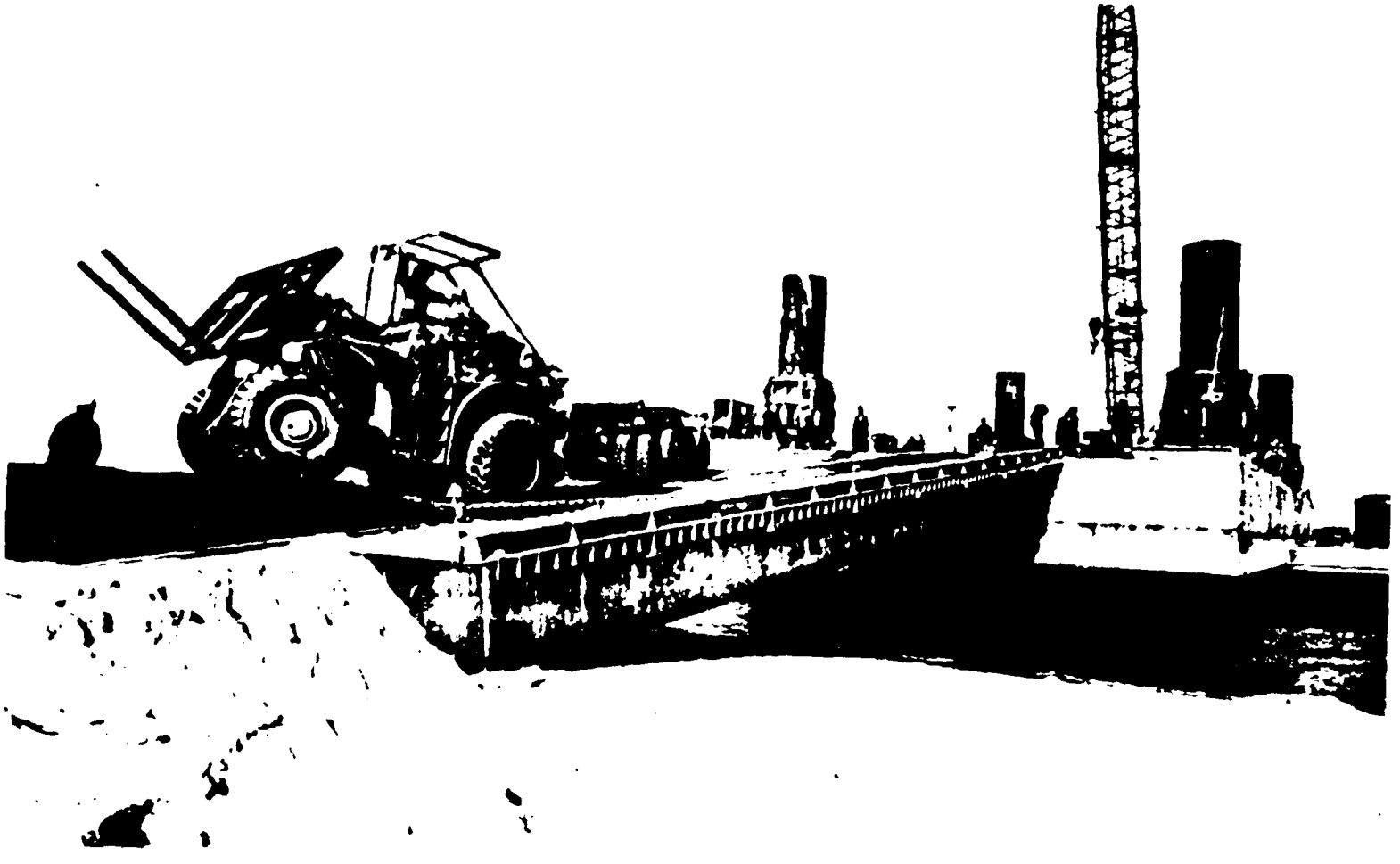
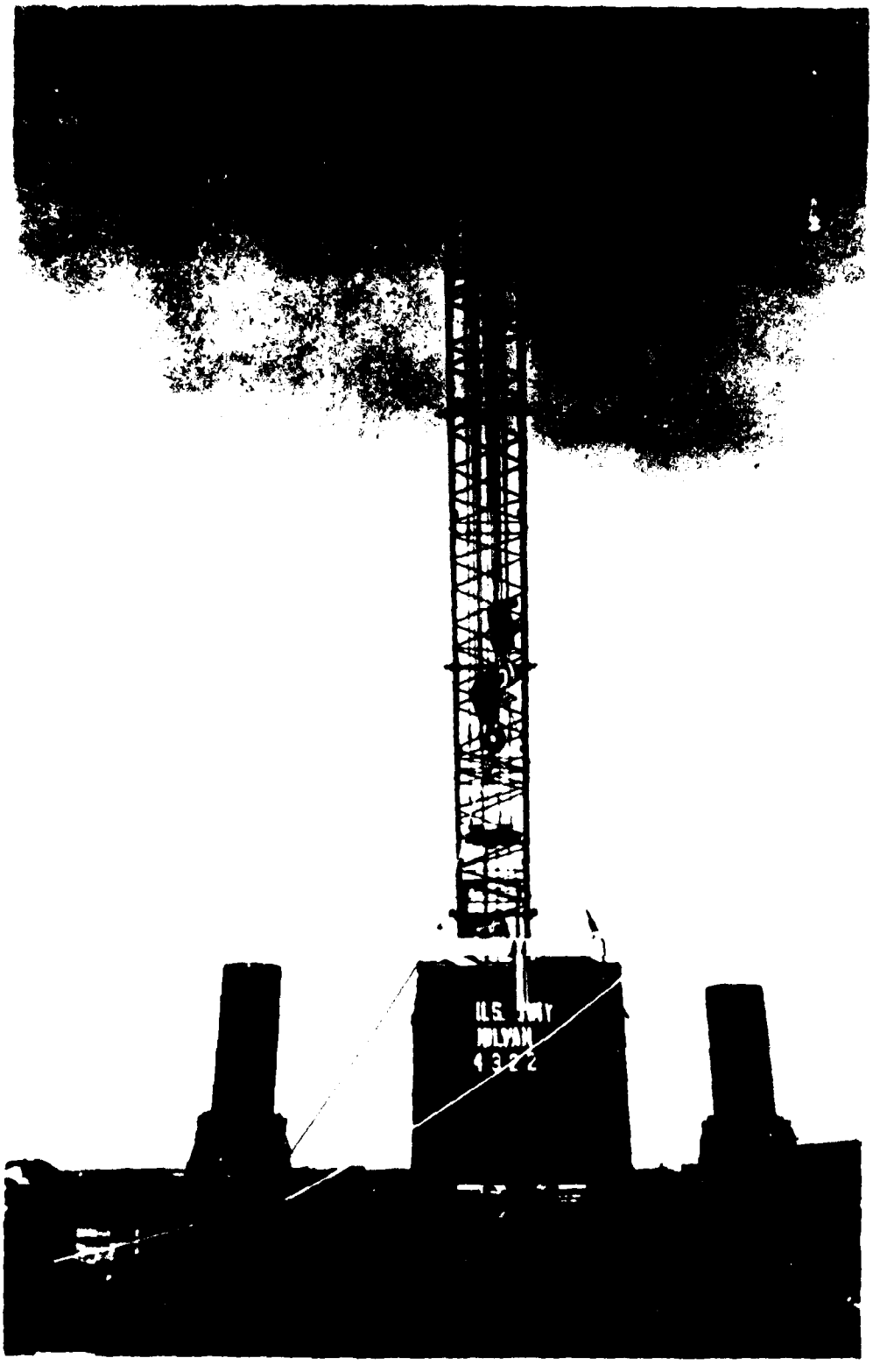


FIGURE D.51. CRANE DELAYED. Until the trailer was positioned under the crane, operations were choked. With experience drivers were able to more rapidly back their trailers up the ramp.



FIG[illegible] [illegible] IN POSITION. Once the milvan chassis was on the [illegible] [illegible] tested.

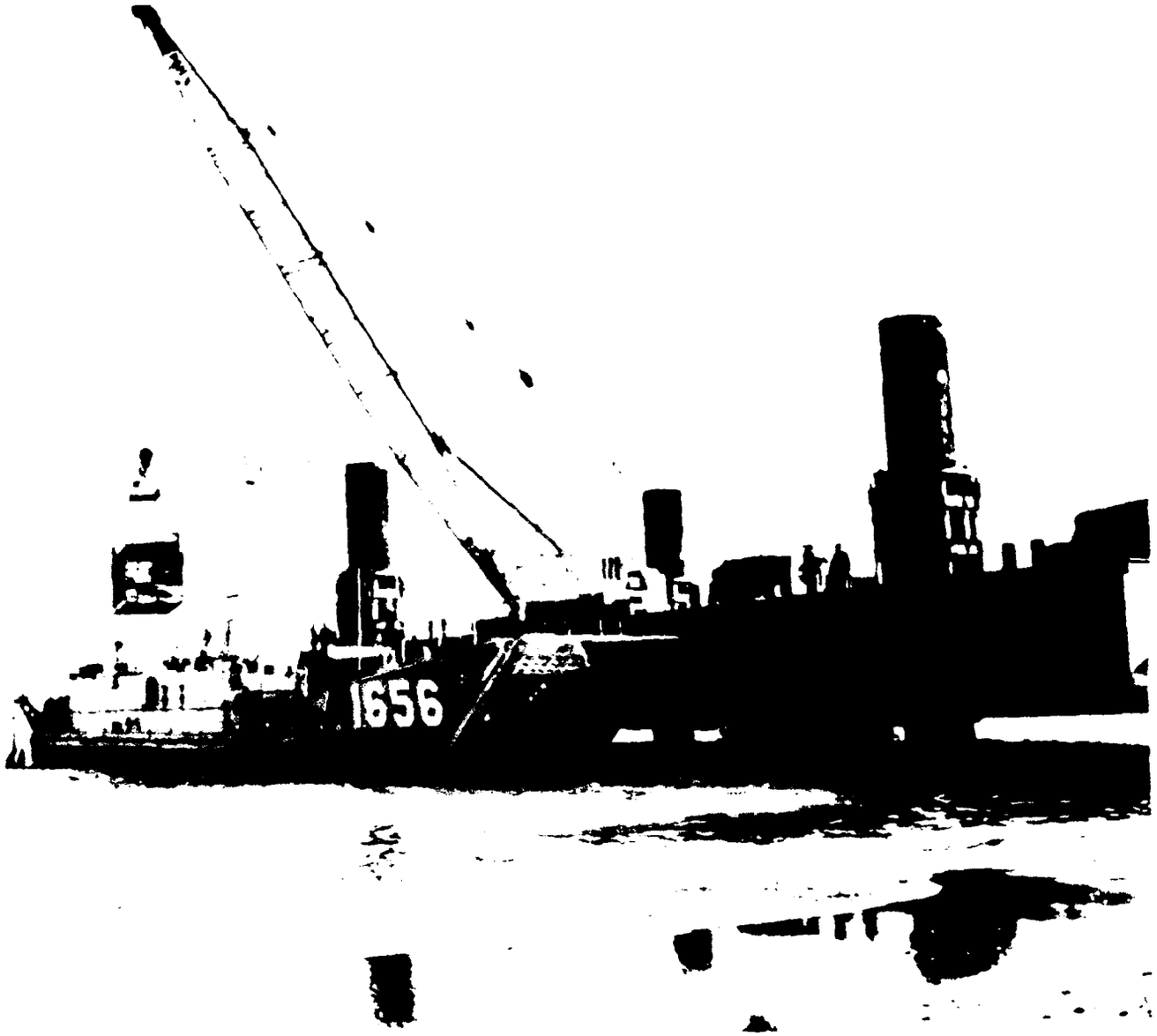


FIGURE [illegible]. [illegible] at high tide. At mean low [illegible] chart could easily [illegible] the Telano pier.

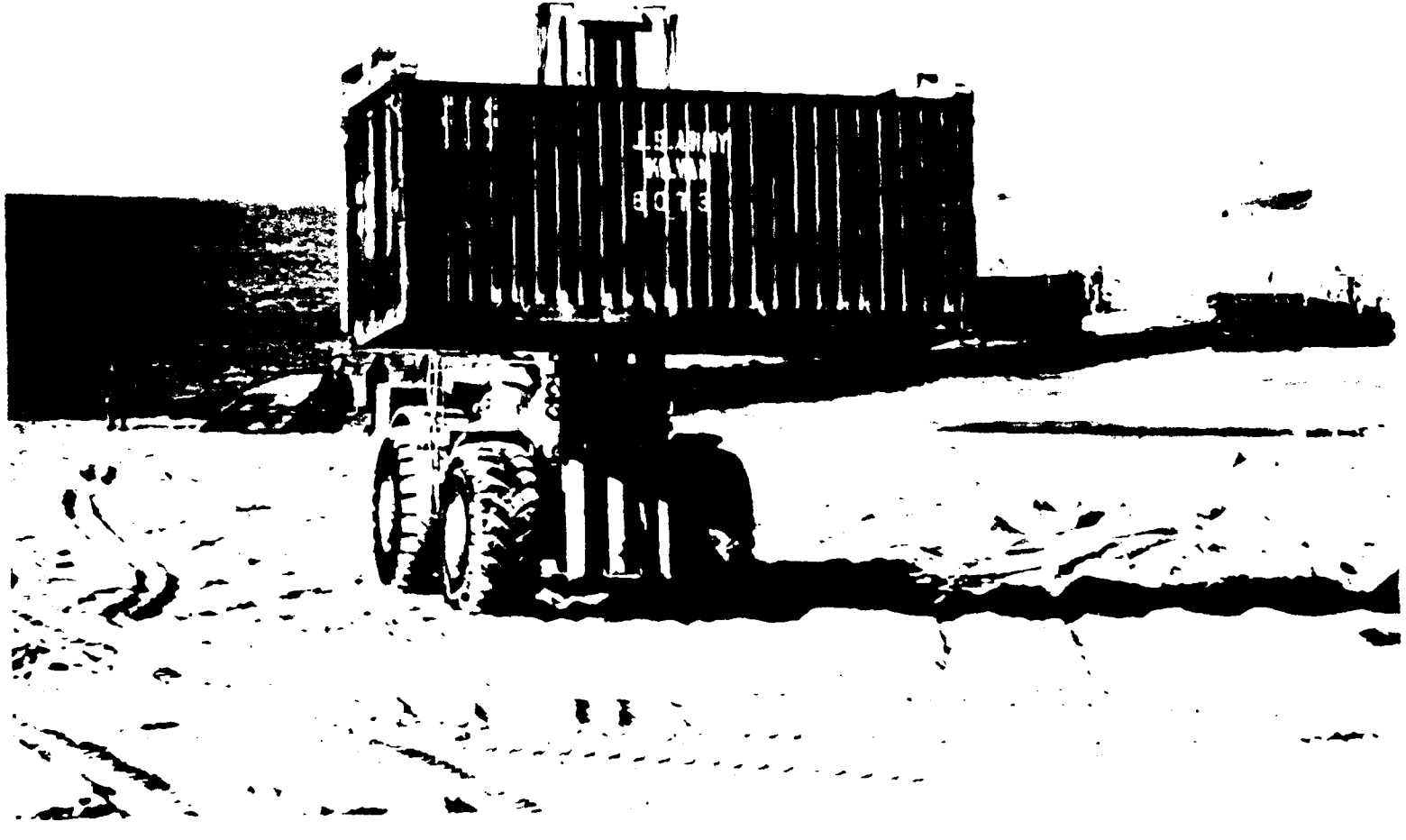


FIGURE [illegible]. [illegible] The Army frontloader carrying a 14-ton container from the causeway ferry [illegible] to land. No beach preparation was necessary.

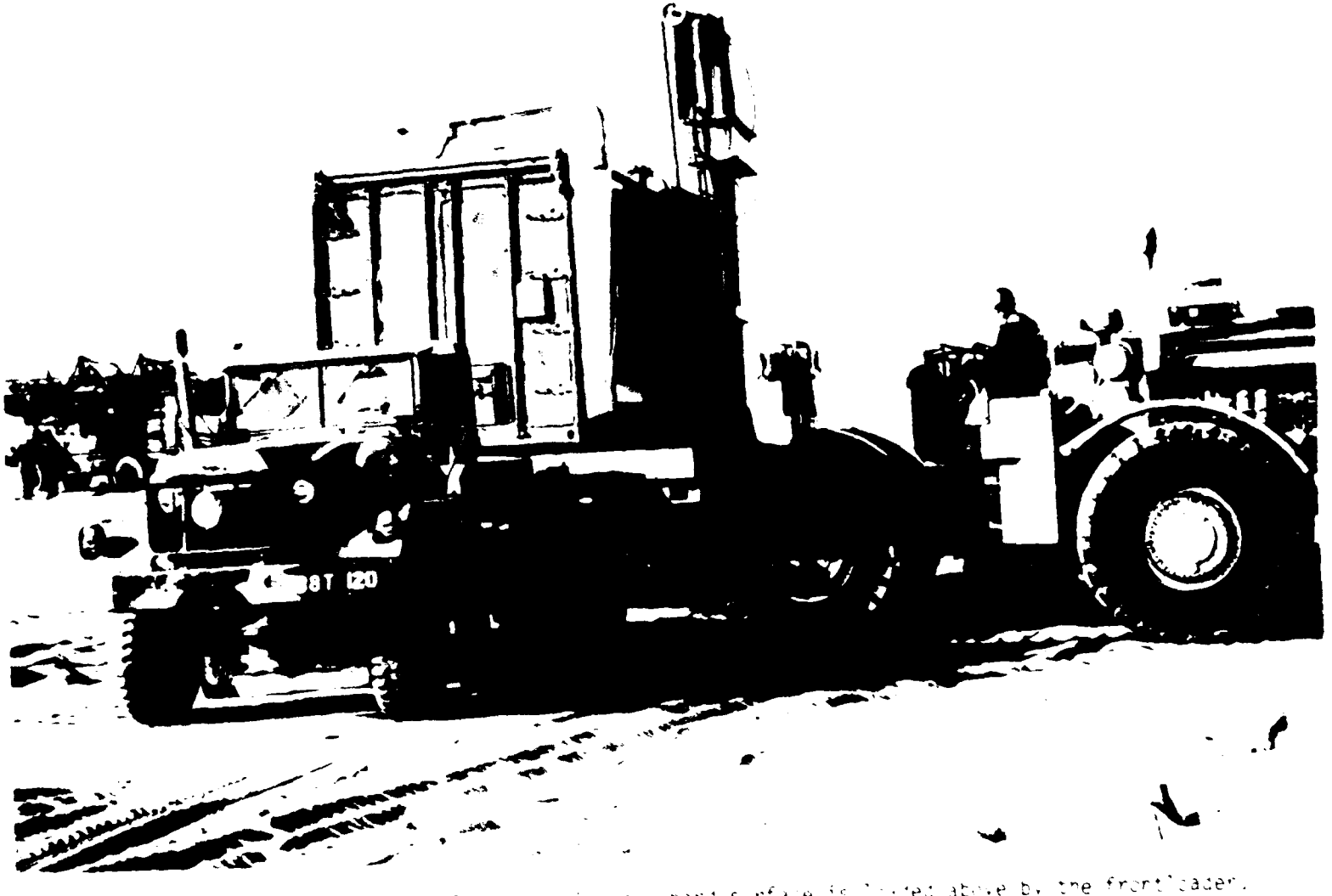


FIGURE 66. TRAILER LOADED. A trailer chassis on a hard surface is loaded above by the front loader. From the time the container was lifted off the causeway to the time it was loaded onto the chassis required approximately 4 minutes.

[illegible] Before a driver could leave the trench, corner fittings had to be removed. The driver was [illegible] on beach matting.

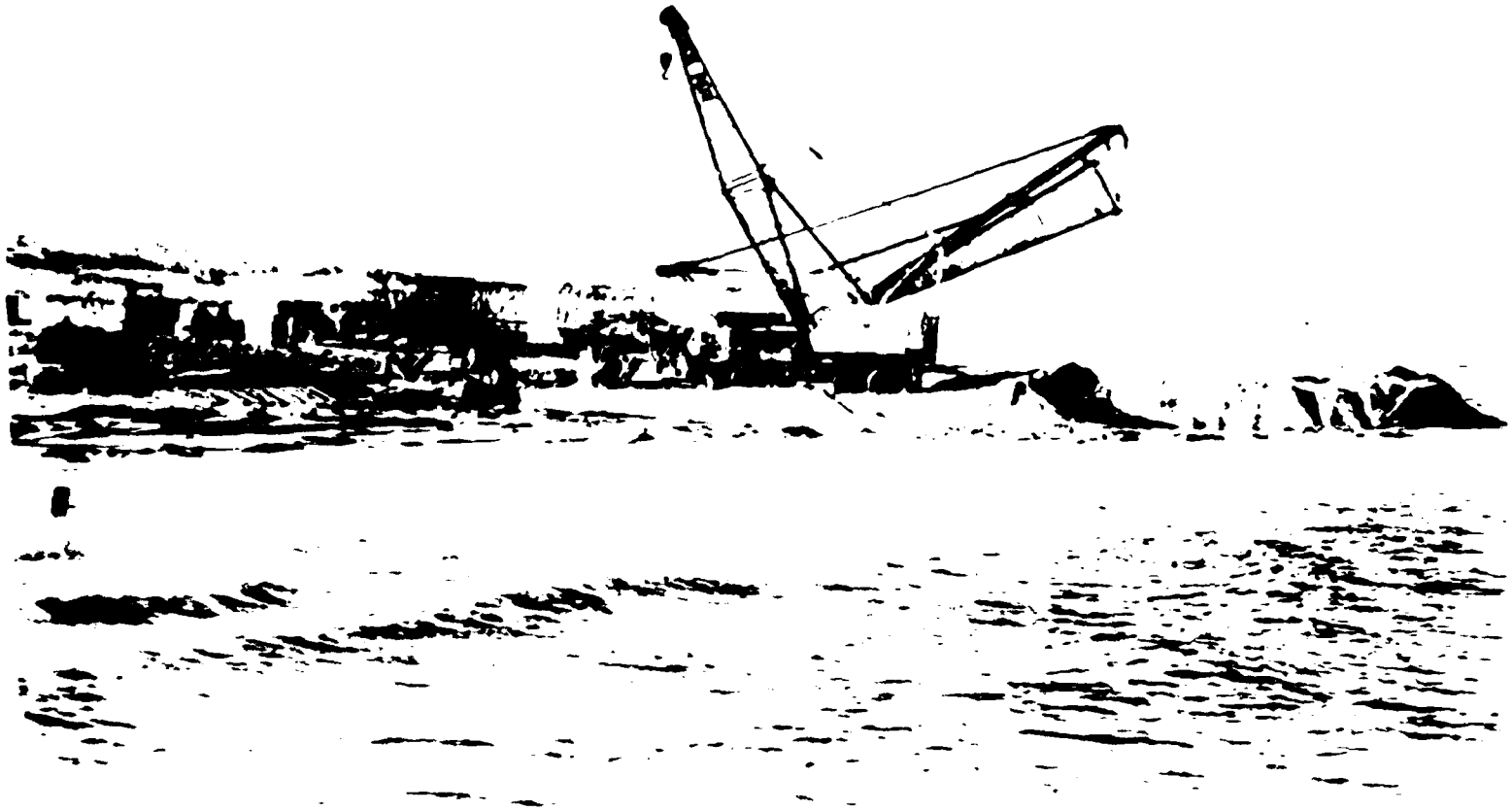


FIGURE [illegible]. BEACH CRANE ASSEMBLY BEGINS. Once the 300-ton crane was landed and turned around, its assembly could be completed. It required [illegible] days before being operational, although no night operations were conducted and [illegible] that time were spent reversing the crane due to the necessity of [illegible] the crane [illegible]

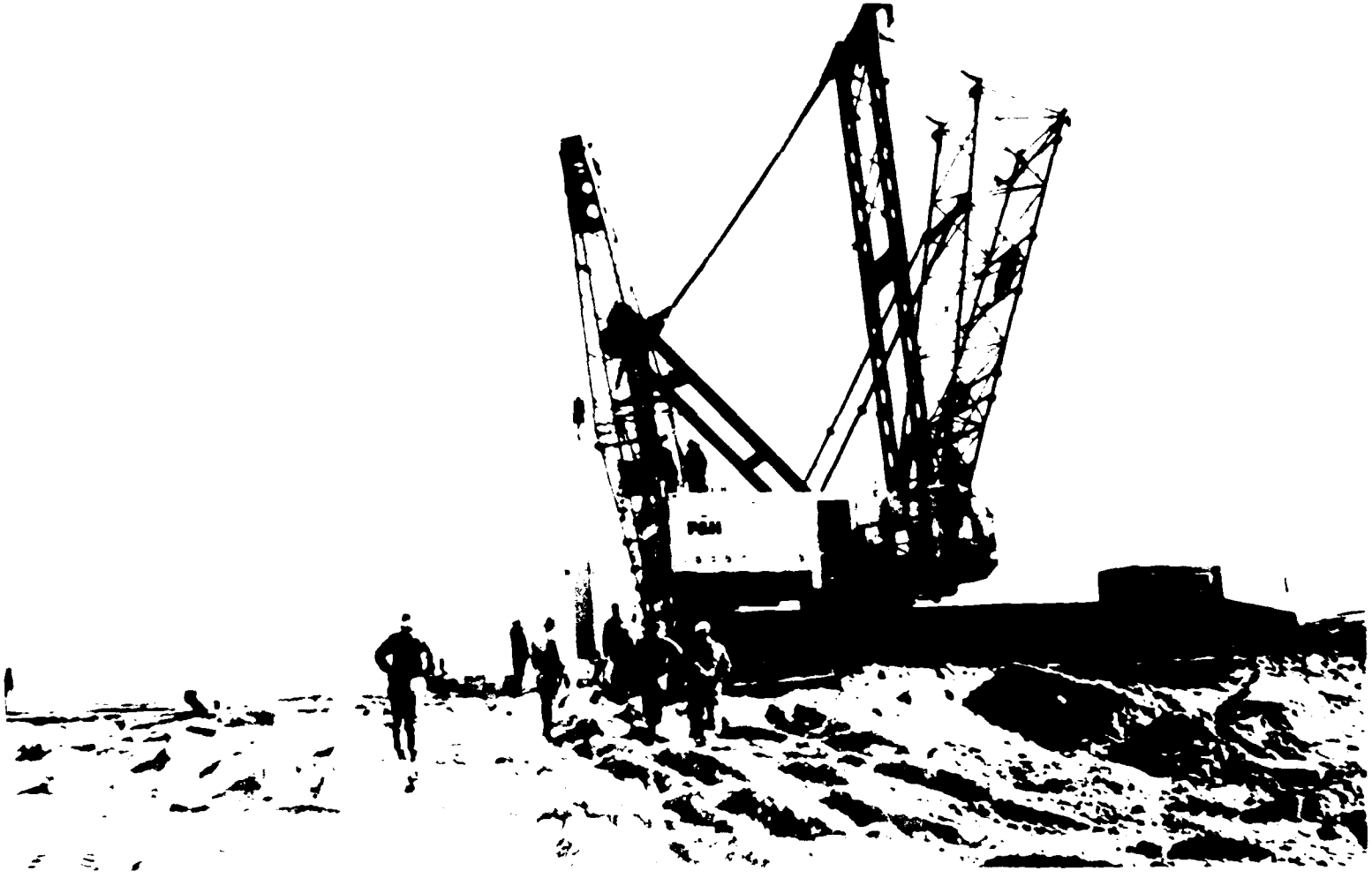


FIGURE D.59. 140-TON CRANE ASSISTS. To recover time lost in turning the 300-ton crane, a 140-ton crane assisted in reassembly. Normally, the 300-ton crane can make itself operational without assistance.

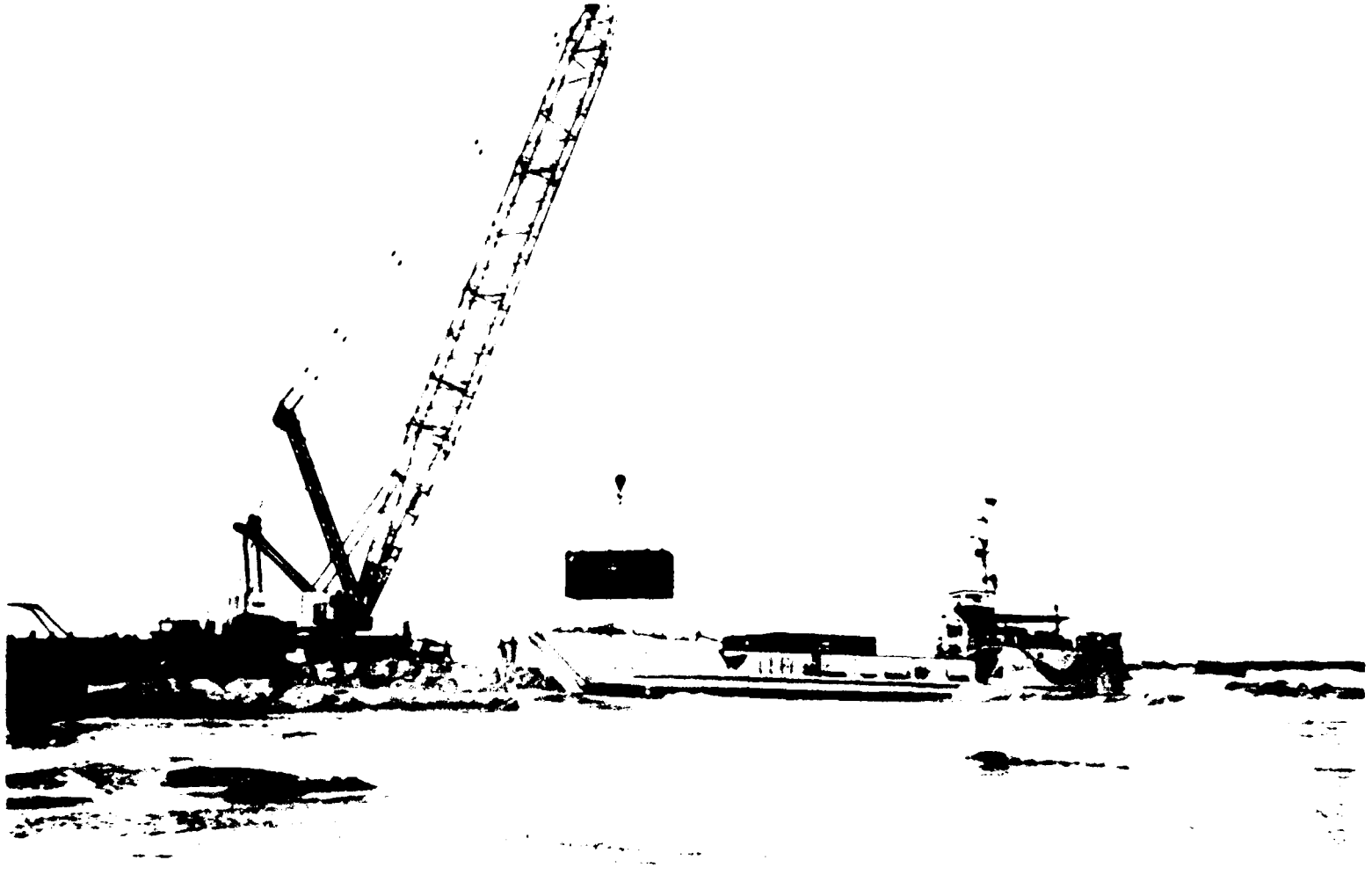


FIGURE D.60. HIGH TIDE OPERATIONS. At high tide landing craft were able to beach within reaching distance of the beach crane and were unloaded without difficulty.

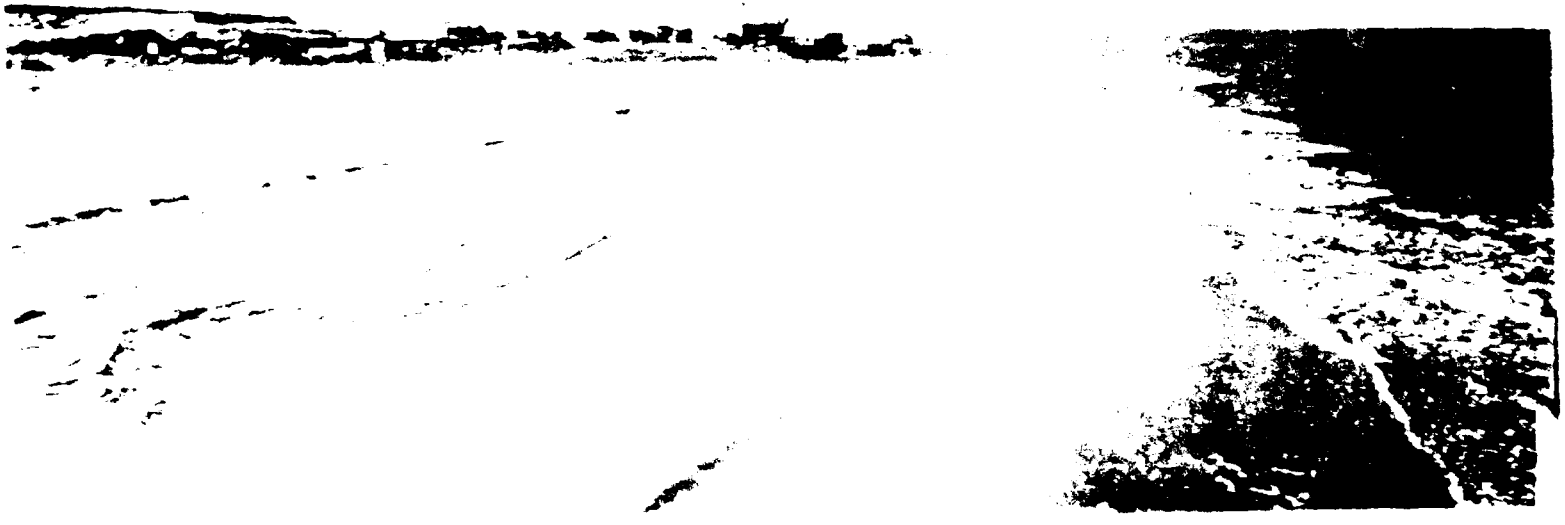


FIGURE [illegible] [illegible] As the tide went out, [illegible] safely within the crane's boom radius. The crane, which weighs approximately [illegible] when operational, is unable to readily move across the sand and follow the tide out.

FIGURE 3.63. CHANNEL DREDGED. In an effort to keep the beach crane operational a channel was dredged seaward of the crane by bulldozers.

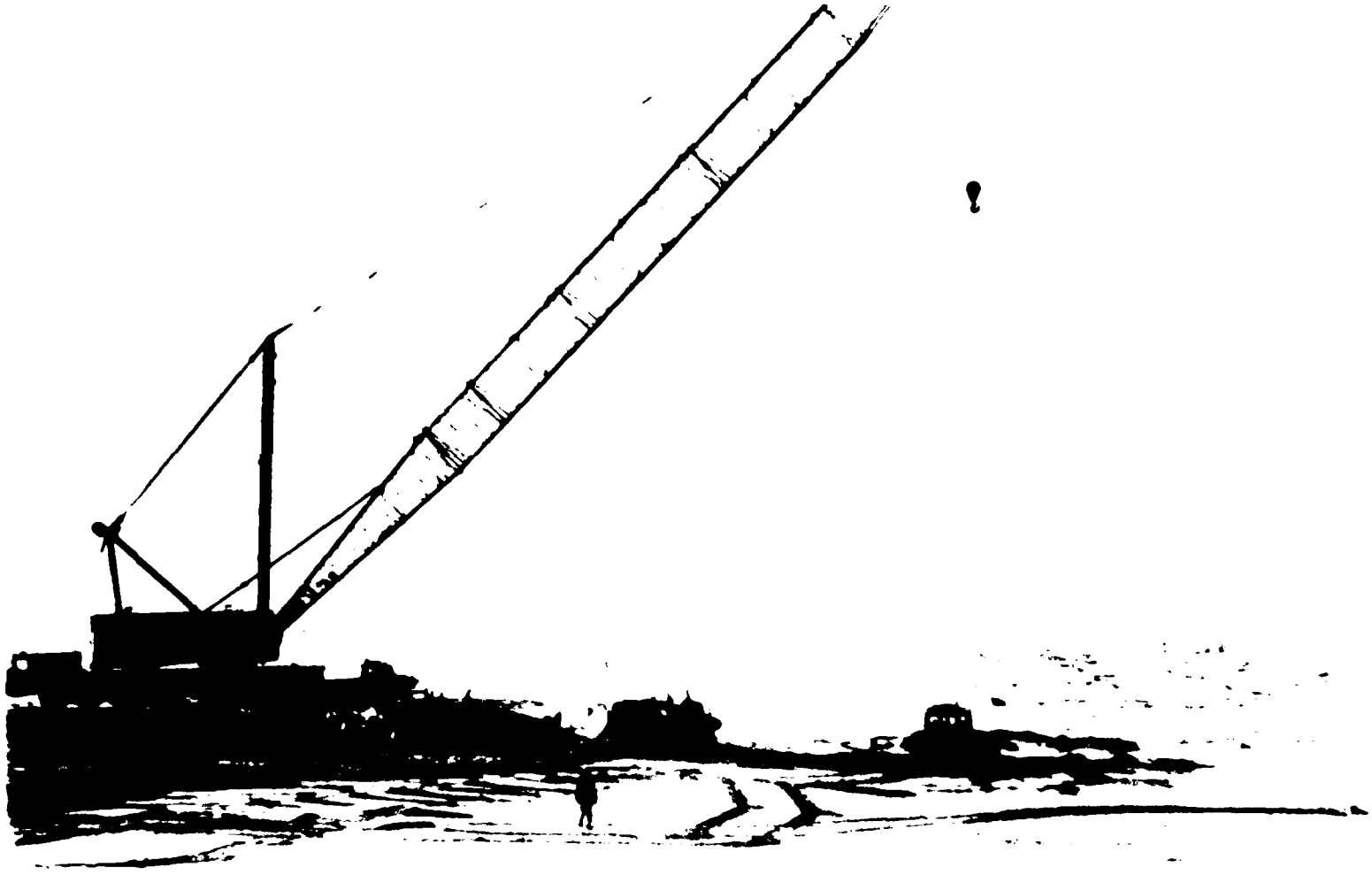


FIGURE D.64. CHANNEL [illegible]. After approximately [illegible] hr of dredging, it was apparent that a channel deep enough could not be excavated. The above photo was taken about 30 minutes before low tide.

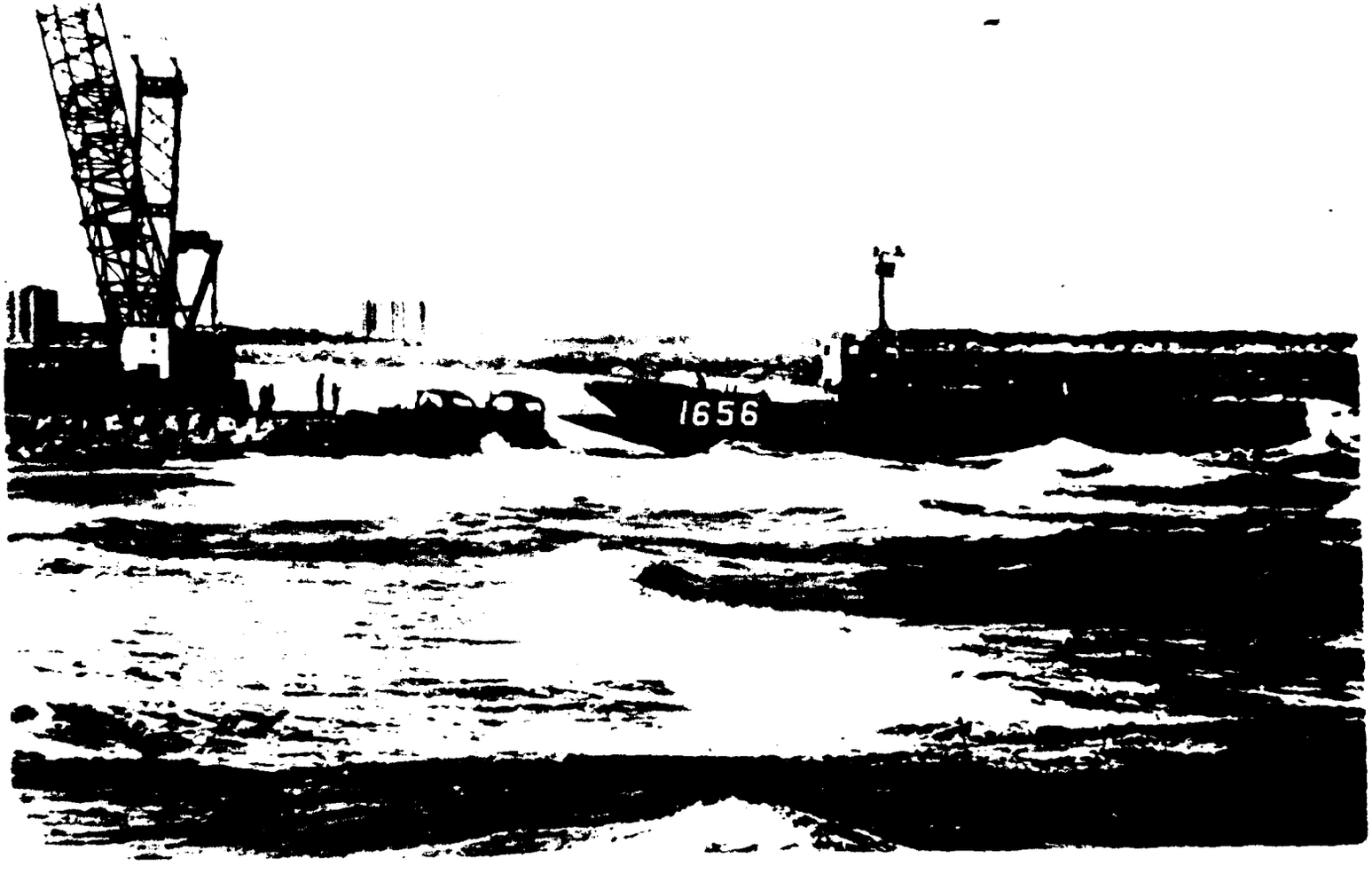


FIGURE D.65. ROUGH WEATHER EXPERIENCED. Another problem was encountered when the surf and winds increased. The sand ramp upon which the crane had been placed began to erode and had to be repaired at high tide by dozers.

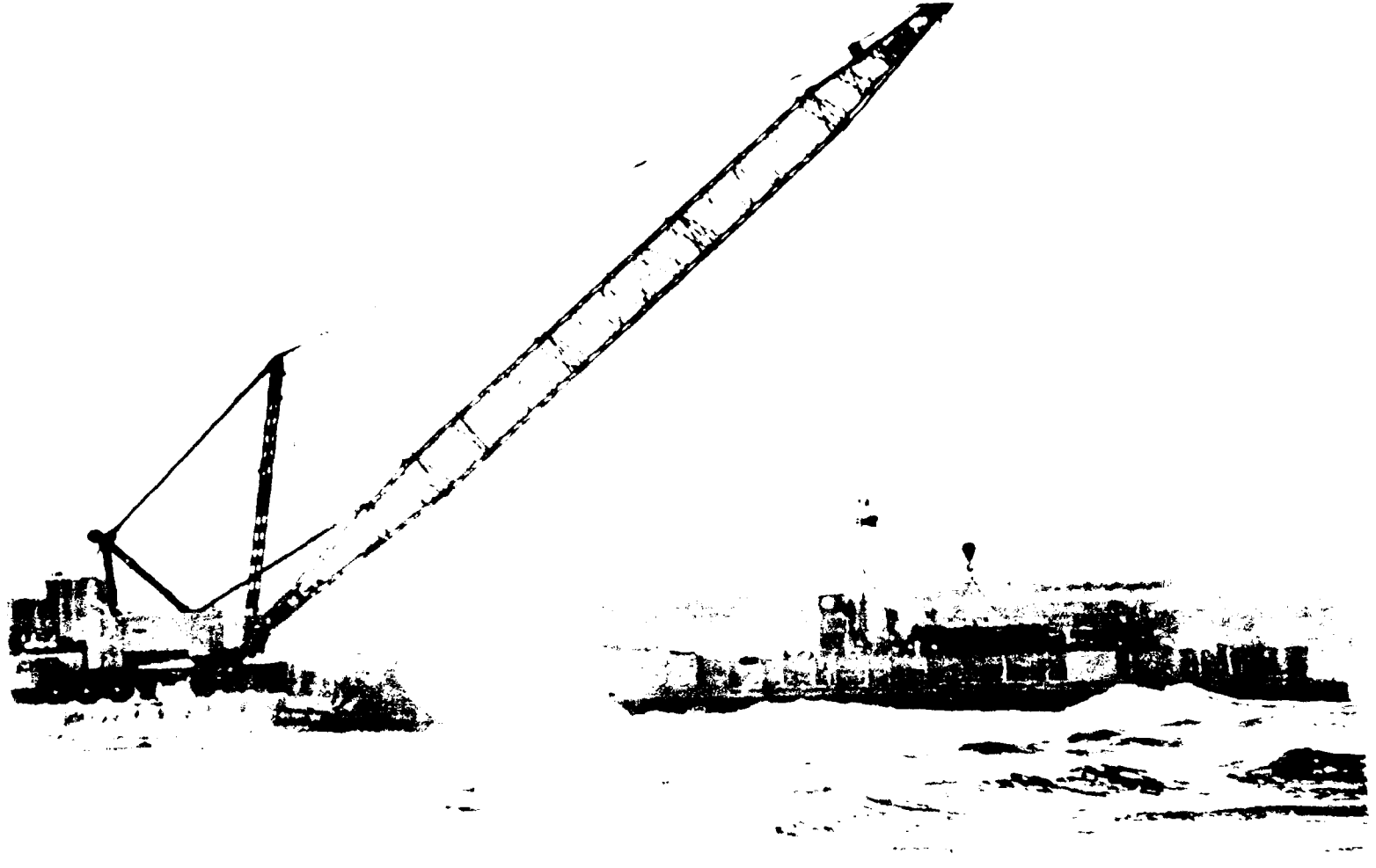
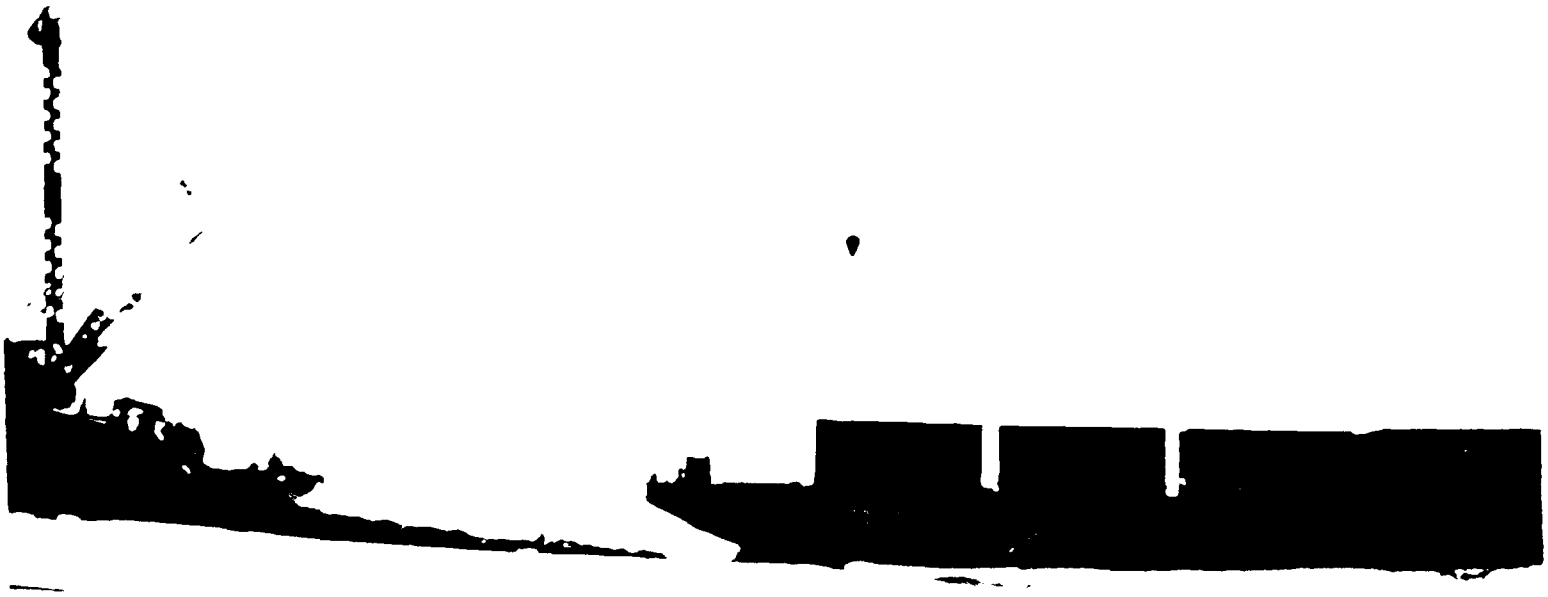


FIGURE C.66. SOME CONTAINERS UNLOADED. Some container unloading was possible before the heavy weather required cessation of operations.



[illegible]

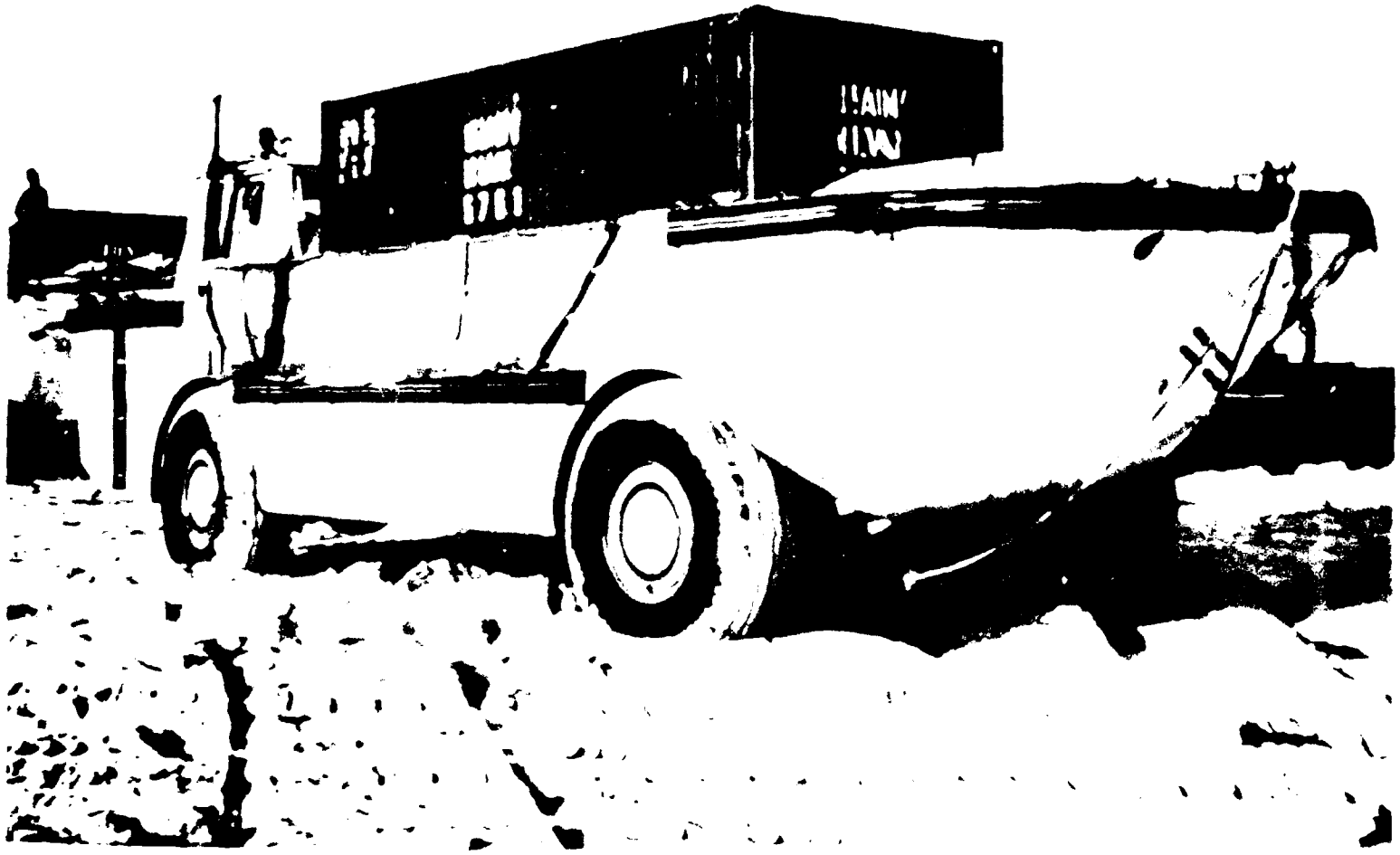


FIGURE C.8A. WAREHOUSING AREA [illegible] At the [illegible] used. A side-loader and a front-loader off-loaded trucks, which [illegible] Milvar chassis, was more often used to off-load amphibians.

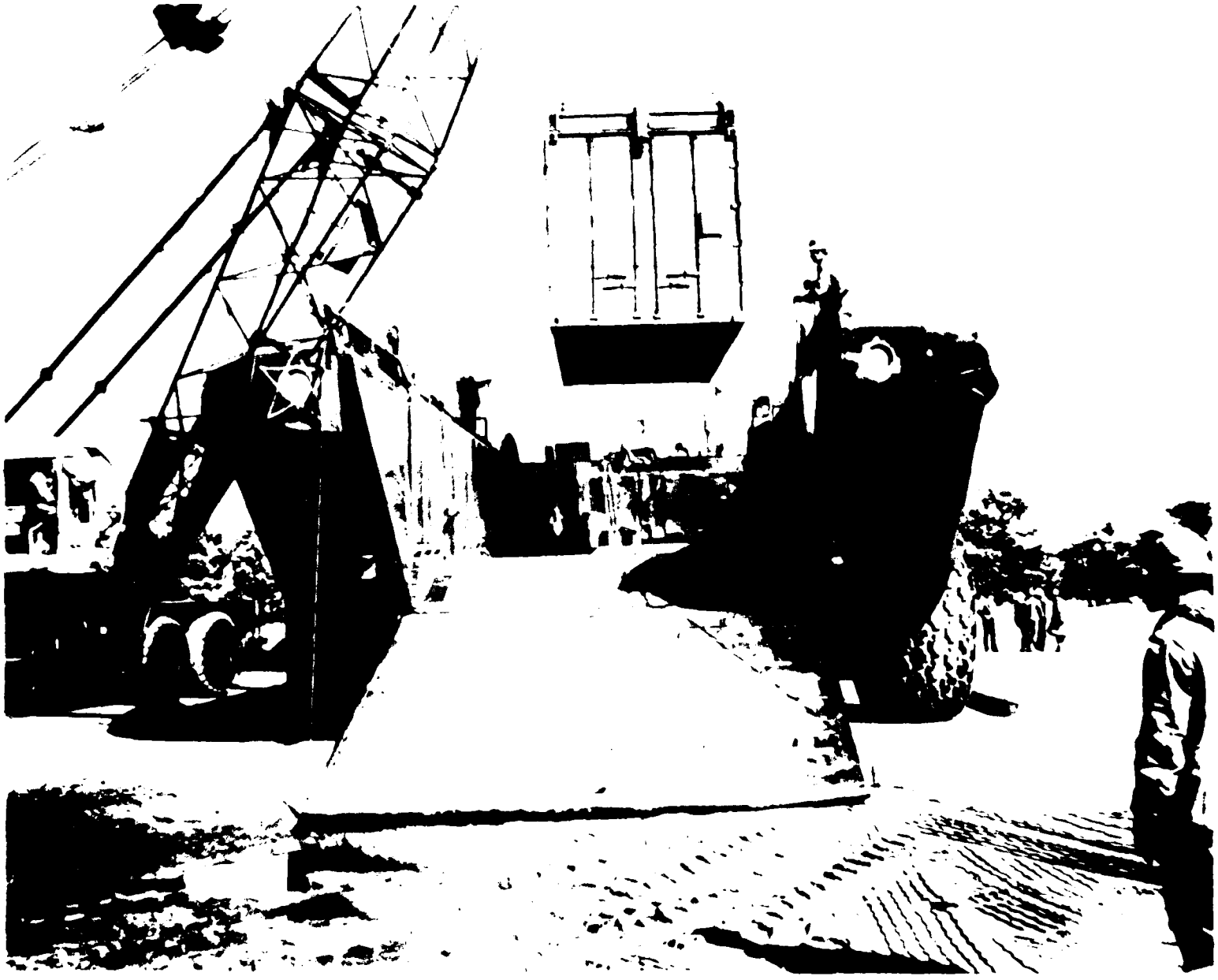


FIGURE 5.70. LARC-LX UNLOADED. A LARC-LX is unloaded at the marshalling site by a 140-ton crane.

FIGURE D.71. FRONTLOADER CLEARS CONTAINER. Once a vehicle was unloaded a frontloader (above) or sideloader was used to clear the discharge point.

FIGURE D.72. SIDELOADER SAVES SPACE. A sideloader (above) is used in the marshalling area to stack a fully-loaded container. Two and three high stacking saves marshalling area stowage space. The sideloader operates only on hard surfaces.

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